DOCUMENT RESUME

ED 401 095 SE 056 978

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TITLE Sea Turtle Trek, Hammocks Beach State Park: An Environmental Education Learning Experience Designed for Grades 6-8.
INSTITUTION North Carolina State Dept. of Environment, Health, and Natural Resources, Raleigh.
PUB DATE Mar 95
NOTE 124p.; Supercedes ED 376 044. Funding for the publication was provided by the North Carolina Wildlife Resources Commission, Non-Game and Endangered Species Program.
AVAILABLE FROM North Carolina Division of Parks and Recreation, P.O. Box 27687, Raleigh, NC 27611-7687.
PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Ecology; Endangered Species; Environmental Education; Habitats; Intermediate Grades; Junior High Schools; Middle Schools; *Natural Resources; *Parks; Science Activities; *Wildlife
IDENTIFIERS Aquatic Life; *North Carolina State Parks System; Resource Management; *Sea Turtles

ABSTRACT

This activity guide, developed to provide hands-on environmental education activities geared to Hammocks Beach State Park in North Carolina, is targeted for grades 6, 7, and 8 and meets the curriculum objectives of the standard course of study established by the North Carolina Department of Public Instruction. Three types of activities are included: pre-visit, on-site, and post-visit. On-site activities are conducted at the park, while pre- and post-visit activities are designed for the classroom. Major concepts include the following: sea turtle life history, resource management, taxonomy, anatomy, dichotomous key, adaptations, natural history, habitat, life cycle, natural and human threats, predator/prey relationships, endangered wildlife, human impact on wildlife, migration, and international resource management. An introduction to reptiles, a vocabulary list, scheduling worksheet, parental permission form, and North Carolina Parks and Recreation program evaluation are included. Appendices contain a sea turtle fact sheet, a Loggerhead sea turtle fact sheet, and sea turtle conservation information. (JRH)

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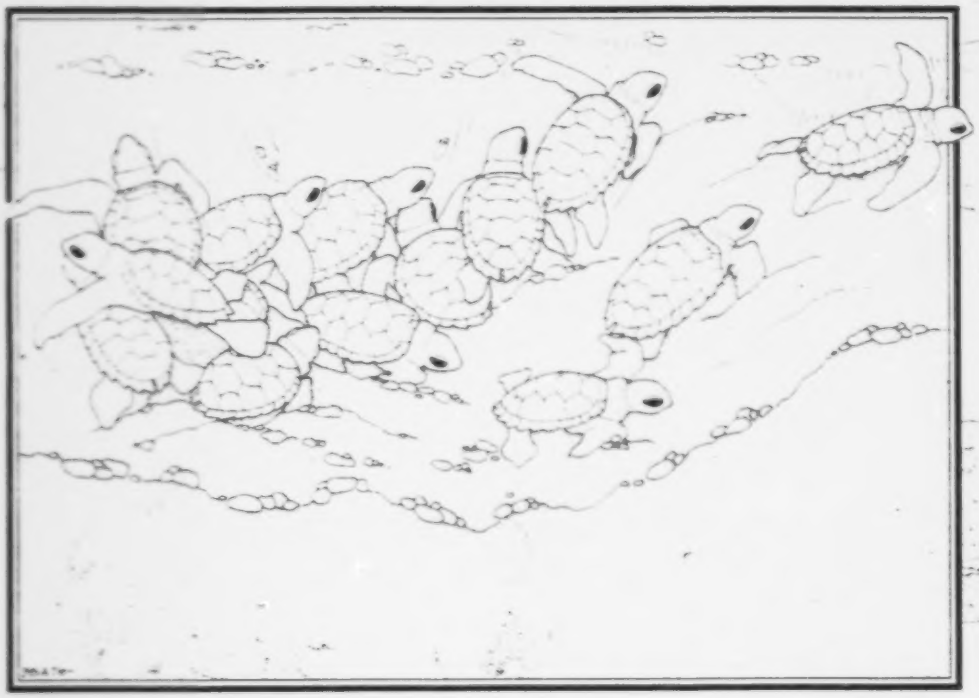
SEA TURTLE



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Hammocks Beach State Park

An Environmental Education Learning Experience

Designed for Grades 6 - 8

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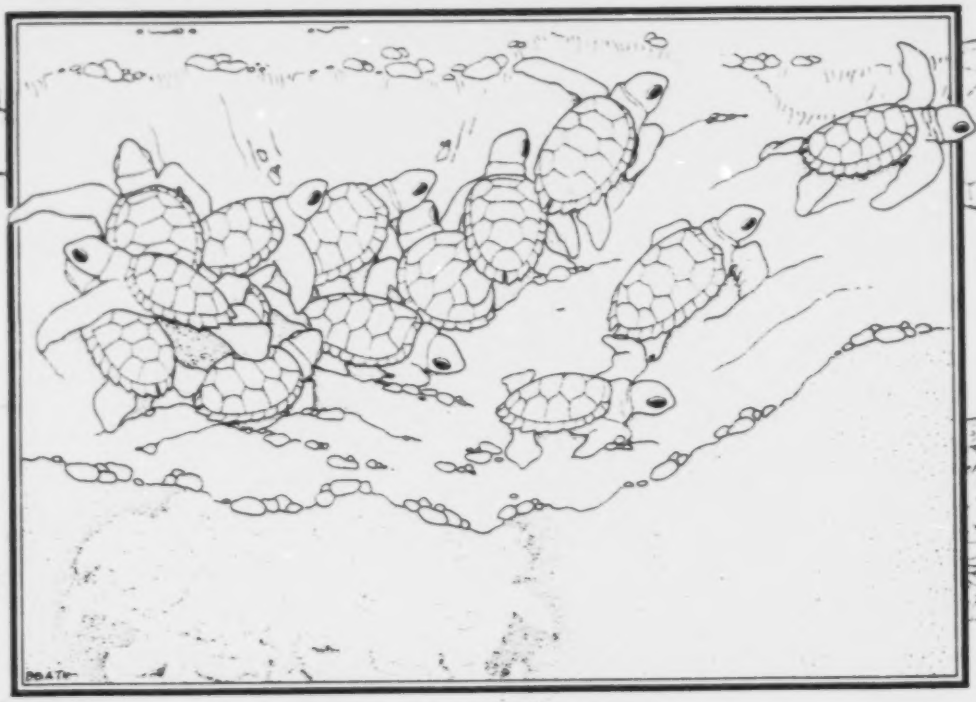

T R E K

Hammocks Beach State Park

An Environmental Education Learning Experience

Designed for Grades 6 - 8

"Christopher Columbus sailed past a group of three islands in 1503 and called them Las Tortugas because of the prevalence of green turtles, which he called the most valuable reptile in the world."

Jack Rudloe
Time of the Turtle

Funding for this publication was generously provided by

North Carolina Wildlife Resources Commission's
Non-game and Endangered Species program and

CP&L

This Environmental Education Learning Experience
was developed by

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and the many individuals and agencies who assisted in the review of this publication.

500 copies of this public document
were printed at a cost of
$3,050 or $6.10 per copy

Printed on recycled paper.
3-95

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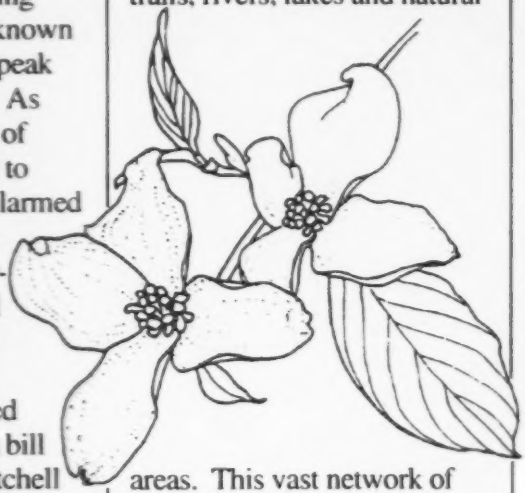
Introduction to the North Carolina State Parks System

Preserving and protecting North Carolina's natural resources is actually a relatively new idea. The seeds of the conservation movement were planted early in the 20th century when citizens were alerted to the devastation of Mount Mitchell. Logging was destroying a well-known landmark - the highest peak east of the Mississippi. As the magnificent forests of this mile-high peak fell to the lumbermen's axe, alarmed citizens began to voice their objections. Governor Locke Craig joined them in their efforts to save Mount Mitchell. Together they convinced the legislature to pass a bill establishing Mount Mitchell as the first state park of North Carolina. That was in 1915.

The North Carolina State Parks System has now been established for more than three quarters of a century. What started out as one small plot of public land has grown into 59 properties across the state, including parks, recreation areas, trails, rivers, lakes and natural areas. This vast network of land boasts some of the most beautiful scenery in the world and offers endless recreation opportunities. But our state parks system offers much more than scenery and recreation. Our lands and waters contain unique and valuable archaeological, geological and biological resources that are important parts of our natural heritage.



As one of North Carolina's principal conservation agencies, the Division of Parks and Recreation is responsible for the more than 125,000 acres that make up our state parks system. The Division manages these resources for the safe enjoyment of the public and protects and preserves them as a part of the heritage we will pass on to generations to come.

An important component of our stewardship of these lands is education. Through our interpretation and environmental education services, the Division of Parks and Recreation strives to offer enlightening programs which lead to an understanding and appreciation of our natural resources. The goal of our environmental education program is to generate an awareness in all individuals which cultivates responsible stewardship of the earth.

For more information contact:

N.C. Division of Parks and Recreation
P.O. Box 27687
Raleigh, NC 27611-7687
919/ 733-4181

Introduction to Hammocks Beach State Park

Hammocks Beach State Park is located on Bear Island, an 892 acre barrier island, with 33 acres on the mainland. The island is three and one-half miles long and less than a mile wide, bordered by the Atlantic Ocean to the south and by salt marshes, estuarine creeks and the Intracoastal Waterway to the north. Bogue Inlet lies at the northeast end of the island, while Bear Inlet lies to the southwest.

Bear Island may be reached by park ferry, Memorial Day through Labor Day; however, private boats can access the island throughout the year. The park office and ferry dock are located on the mainland in Swansboro, off of NC Highway 24. The 2.5 mile ferry ride takes about 25 minutes. From the island ferry dock, a half-mile walk crosses the island to the beach. Natural history exhibits are available on the island to enhance environmental education programs.

On the island, shrub thickets and maritime forests create a wilderness environment, yet in places it's easy to imagine you're in a desert, with large expanses of sand. Sea water has not washed over the island in recent years, thus large dunes and ridges dominate the landscape. Migrating sand, carried by the wind, often buries portions of the maritime forest.

Program Options:

The variety of coastal environments found at Hammocks Beach State Park provide an unequalled classroom for teaching the processes of coastal ecology, geology, estuaries, wetlands and cultural history. Bear Island is an important nesting site for threatened loggerhead sea turtles. Programs on these and other topics are available by request.

Scheduling a Trip:

To make a reservation, call the park office and complete a copy of the scheduling worksheet in the activity packet, on page 9.1. Provide this information to the park at least one month in advance of your arrival. Hammocks Beach State Park will make every effort to accommodate persons with disabilities.

NOTE: Bear Island may be reached by the park ferry. School groups can schedule programs on the island from April 15 through October 15. A small fee is charged for the ferry.

In the summer and on hot days, the sun and sand can be very hot. Please wear shoes, hats and sunscreen. Water is available at the bathhouse.

Before the Trip:

1. Visit the park without the participants prior to the scheduled group trip. This will give you a chance to become familiar with facilities and park staff, and provide you the opportunity to identify potential problems.

2. Discuss behavior expectations with adult leaders and participants when planning the trip. Discuss the park rules listed. Emphasize safety.

3. Inform the group about ticks, poison ivy, chiggers and biting flies. Discuss the need to use insect repellent.

4. Inform your group of the need to dress appropriately for the season. Walking shoes are suggested for all seasons. The weather can be very hot and humid from late spring through early fall. Sunscreen and hats are advised.

5. Have everyone wear a name tag. For safety, please color-code them (for groups) and establish a buddy system.

6. *Group leaders are responsible for obtaining a consent form from each participant including a listing of any health considerations and medical needs.* These forms are available in the activity packet on page 9.2.

7. If your group plans to collect any plants, animals or minerals within the park, a Research Activity Permit is required. Contact the park to obtain a permit application.

8. *If you will be late or need to cancel your trip, please notify the park as far ahead as possible.*

9. Remember to allow for the time it takes to ride the ferry, walk to the beach, and return, when scheduling a trip.

While at the Park:

Please obey the following rules:

1. To help you get the most out of the experience and increase the chance of observing wildlife, be as quiet as possible while in the park.

2. During the ferry ride, everyone should remain seated.

3. On hikes, walk behind the leader at all times. Stay on the trails. Running is not permitted.

4. All plants and animals within the park are protected. Breaking plants and harming animals are prohibited in all state parks. This allows future visitors the same opportunity to enjoy our natural resources.

5. Picnic in designated picnic areas only. Help keep the park clean and natural; do not litter.

6. Swim only in the designated area when lifeguards are on duty. The ocean is a dangerous body of water, with hazardous drop-offs and currents. Please advise your group on specific safety precautions.

7. In case of accident or emergency, contact park staff immediately.

Following the Trip:

1. Complete the post-visit activity in the Environmental Education Learning Experience packet.

2. Build upon the field experience and encourage participants to seek answers to questions and problems encountered at the park.

3. Relate the experience to classroom activities and curriculum through reports, projects, demonstrations, displays and presentations.

4. Give tests or evaluations, if appropriate, to determine if students have gained the desired information from the experience.

5. File a written evaluation of the experience with the park. Evaluation forms are available in the activity packet on page 9.3. We appreciate your comments.

Park Information:

Hammocks Beach State Park
1572 Hammocks Beach Road
Swansboro, NC 28584
Tel: (910) 326-4881
Fax: (910) 326-2060

Office Hours:

Monday - Friday
8:00 a.m. - 5:00 p.m.

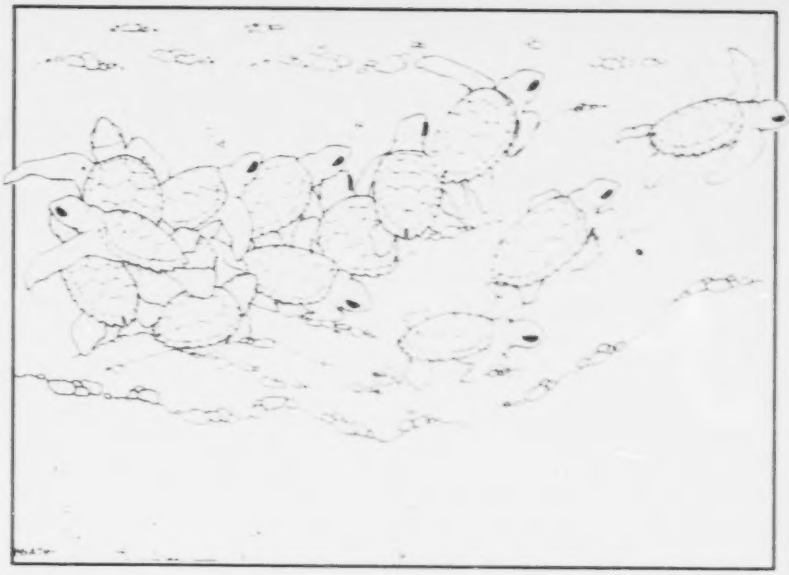
Weekends

May-Sep	8:00 a.m. - 5:00 p.m.
Oct-Apr	8:00 a.m. - 9:00 a.m.
	5:00 p.m. - 6:00 p.m.

Hours of Operation:

Jun-Aug	8:00 a.m. - 7:00 p.m.
Sep-May	8:00 a.m. - 6:00 p.m.

Introduction to the Activity Packet for Hammocks Beach State Park



The Environmental Education Learning Experience, *Sea Turtle Trek*, was developed to provide environmental education through a series of hands-on activities geared to Hammocks Beach State Park. This educator's activity packet, designed to be implemented in the sixth to eighth grades, meets curriculum objectives of the standard course of study established by the North Carolina Department of Public Instruction. However, these activities may be adapted to other grades as well. The packet includes three types of activities:

1) pre-visit activity
2) on-site activity
3) post-visit activity

The on-site activity will be conducted at the park, while pre-visit and post-visit activities are designed for the classroom. These activities may be performed independently or in a series to build upon students' newly gained knowledge and experiences.

The Environmental Education Learning Experience, *Sea Turtle Trek*, will expose students to the following major concepts:

- **Animal adaptation**
- **Sea turtle life cycle**
- **Endangered species**
- **Natural and human threats to species**
- **Resource management**

The first occurrence of a vocabulary word used in these activities is indicated in **bold type**. Definitions are listed in the back of the activity packet. A list of the reference materials used in developing the activities follows the vocabulary list.

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Special Considerations

On-site activities may require hiking which could expose the participants to hot, humid conditions and full sunlight. Participants should be protected from exposure to sunlight by wearing hats and sunscreen. They are reminded to drink plenty of fluids.

Accessibility to some of these areas may be difficult for persons with special needs.

All field trips to Bear Island will require a ferry ride and nominal fee.

Introduction to Reptiles

Reptiles are categorized as **vertebrates**, animals with backbones. They have evolved from amphibians and have the following characteristics: the ability to breathe air; little or no control of their body temperature (ecotherms); **scales** or **scutes** which protect the animals' skin; and the ability to lay eggs (oviparous) on land or, in a few cases, give live births (viviparous). Reptiles generally continue to grow throughout their entire lives, never reaching a maximum limit in size.

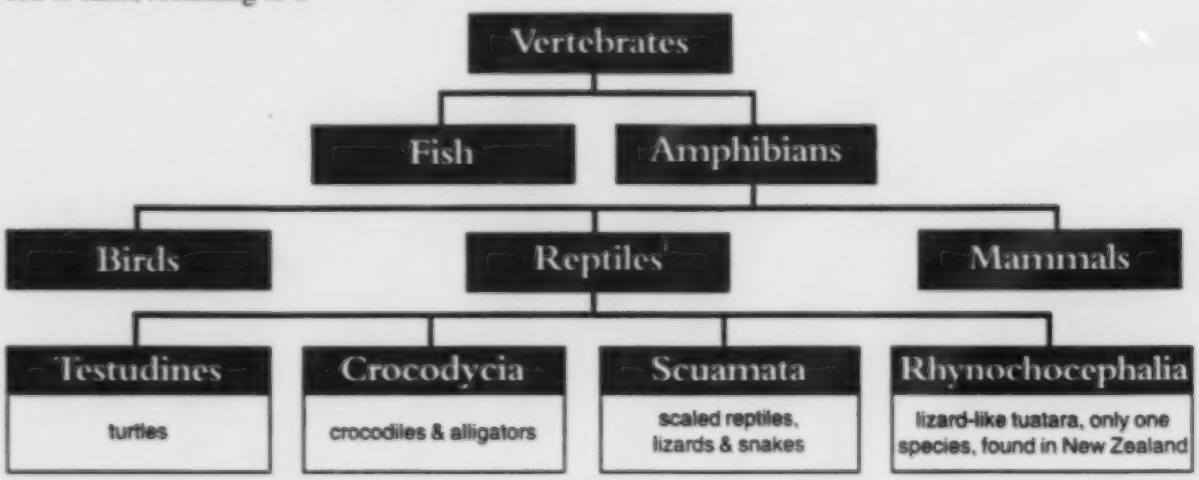
The class Reptilia, to which all reptiles belong, includes turtles, lizards, snakes and alligators. Individual "groups" of reptiles have evolved for over 250 million years. Each has adapted to a specific habitat. Reptiles were the first vertebrates to escape, for the most part, dependency on water. Sea turtles have reversed the evolutionary move from sea to land, returning to a dependency on marine environments; only the females revisit the land, and that is to lay their eggs, then return to the sea once more. (Amphibians, often mistaken for reptiles, differ most obviously from reptiles in that they are restricted to the confines of a moist environment at some time in their life cycles.) At one time, reptiles were able to occupy not only land and water, but also the air. Dinosaurs are often considered to have been members of the class Reptilia. Today worldwide, there are approximately 5000 species of reptiles.

These members of the animal kingdom are a poorly understood group of creatures. **Herpetologists**, scientists who study reptiles, are trying to change this.

Reptiles occupy **habitats** that are highly vulnerable to destruction from human intervention. Most reptiles are found in warmer regions or temperate climates of the world, due to their inability to control their body temperature. Therefore, temperature is the limiting factor in their distribution. Often, reptiles are dormant in cold conditions.

As a group, reptiles have a diverse diet. Nearly all are predatory **carnivores**. Yet some are **omnivorous**, eating both animals and plants or **herbivorous**, strictly vegetarian.

In this environmental education learning experience, you will study about a specific group of reptiles–sea turtles. Hammocks Beach State Park provides a suitable habitat for these reptiles to complete an important part of their life cycles. As you study more about sea turtles, refer back to this information to help you understand more about these unique creatures.



Activity Summary

The following outline provides a brief summary of each activity, the major concepts introduced and the objectives met by completion of the activity.

I. Pre-Visit Activities

#1 A Sea Turtle Tale (page 3.1.1)

Students will read a story about one person's encounter with loggerhead sea turtles. They will complete a word search and fill in a worksheet to reinforce vocabulary words.

Major Concepts:
- Sea turtle life history
- Resource management

Learning Skills:
- Reading for key words
- Acquiring information

Objectives:
- Name the most common sea turtle that nests on North Carolina's beaches.
- Explain two aspects of the park's resource management program.
- Learn 10 new vocabulary words by recalling them from a story.
- Describe the life cycle of a loggerhead sea turtle.

#2 Turtle Key (page 3.2.1)

Students will use a dichotomous key to identify the five species of sea turtles normally found off the North Carolina coast.

Major Concepts:
- Taxonomy
- Sea turtle external anatomy
- Dichotomous key

Learning Skills:
- Observing, classifying and communicating
- Reading informational materials (scientific keys)

Objectives:
- Give an operational definition of taxonomy.
- List the names of three different types of scutes that are used to classify sea turtle species.
- On a diagram of sea turtle external anatomy, identify the correct location of plastron, carapace, inframarginal scutes, lateral scutes and prefrontal scutes.
- Use a dichotomous key to correctly identify pictures of five sea turtle species.

#3 Reptile Relative (page 3.3.1)

Students will participate in a cooperative learning activity designed to illustrate the similarities and differences between the loggerhead sea turtle and the box turtle.

Major Concepts:

- Adaptations
- Anatomy
- Natural history

Learning Skills:

- Classifying, communicating, inferring
- Participating effectively in groups
- Organizing information

Objectives:

- List five adaptations that allow the loggerhead sea turtle to survive in the marine environment.
- List five adaptations that allow the eastern box turtle to survive in a terrestrial environment.
- Identify similarities and differences between the loggerhead sea turtle and the eastern box turtle.
- Give at least two reasons why the sea turtle is endangered and the box turtle is not.

II. On-Site Activities

#1 Lost Habitat (page 4.1.1)

Students will work in teams to evaluate potential nesting sites for sea turtles on Bear Island. They will also complete a worksheet evaluating potential threats to sea turtle survival.

Major Concepts:

- Habitat
- Resource management

Learning Skills:

- Classifying, inferring, predicting, communicating
- Evaluating ideas, planning and decision-making

Objectives:

- Describe six threats to loggerhead sea turtles.
- Describe two resource management efforts used by park personnel to protect loggerhead sea turtle nesting habitat.
- Explain how Hammocks Beach State Park is a sea turtle sanctuary.

#2 Talking Turtle (page 4.2.1)

Students will view a slide program at the park and participate in a quiz game "Turtles in Jeopardy."

Major Concepts:

- Loggerhead sea turtle life cycle
- Adaptations
- Natural and human threats
- Resource management

Learning Skills:

- Communicating
- Listening for details and acquiring information

Objectives:

- Describe the nesting process of the loggerhead sea turtle.
- List five adaptations that help loggerheads to survive in marine environments.
- List five natural threats to loggerhead survival.
- List five human threats to loggerhead survival.
- Describe resource management efforts used to protect sea turtles.

#3 Crawl For Life (page 4.3.1)

Students will play a predator/prey game on the beach to simulate what can happen to hatchling sea turtles as they crawl to the ocean. They will discuss reasons why sea turtles are endangered and what can be done to protect them.

Major Concepts:

- Adaptations
- Predator/prey relationships
- Endangered wildlife
- Human impact on wildlife

Learning Skills:

- Communicating, inferring, predicting, interpreting data
- Graphing, using probabilities
- Responding creatively to personal experiences

Objectives:

- List three natural predators of loggerhead sea turtles.
- Describe the nesting cycle of loggerhead sea turtles.
- Explain the low survival rate of hatchlings and how sea turtles compensate for young lost to predators.
- Describe how humans impact sea turtle reproduction.

III. Post-Visit Activities

#1 Sea Turtle Trek (page 5.1.1)

Students will play a board game that emphasizes the life cycle of sea turtles and the threats to their survival.

Major Concepts:

- Life cycle
- Natural threats to sea turtle survival
- Human threats to sea turtle survival

Learning Skills:

- Communicating
- Interpreting information

Objectives:

- Describe the life cycle of the loggerhead sea turtle.
- Explain the low rate of hatchling survival.
- List three natural threats and three human-created threats to sea turtle survival.

#2 Turtle Tag (page 5.2.1)

Students will track a tagged loggerhead sea turtle as it moves from North Carolina to the Caribbean. They will mark recorded sightings on a map and calculate approximate distances between sightings.

Major Concepts:

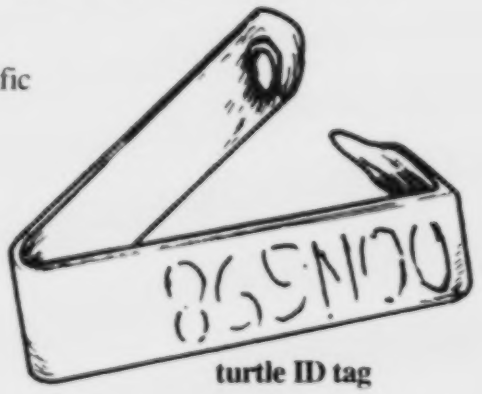
- Endangered species
- Migration
- Latitude and longitude
- International resource management

Learning Skills:

- Observing, measuring, communicating
- Map reading, using information for decision-making
- Applying and expanding information
- Computing, using spatial models

Objectives:

- Know the names and locations of two countries in the Western Hemisphere and two major cities within these countries.
- List two methods used to tag turtles.
- Demonstrate the ability to correctly identify specific latitudes and longitudes on a map.
- Demonstrate the ability to calculate distances using a map scale.



turtle ID tag

'3 Nest Management (page 5.3.1)

Students will analyze data from the Hammocks Beach 1992 sea turtle nesting season. They will calculate averages and percentages to experience how data is compiled for a resource management project.

Major Concepts:

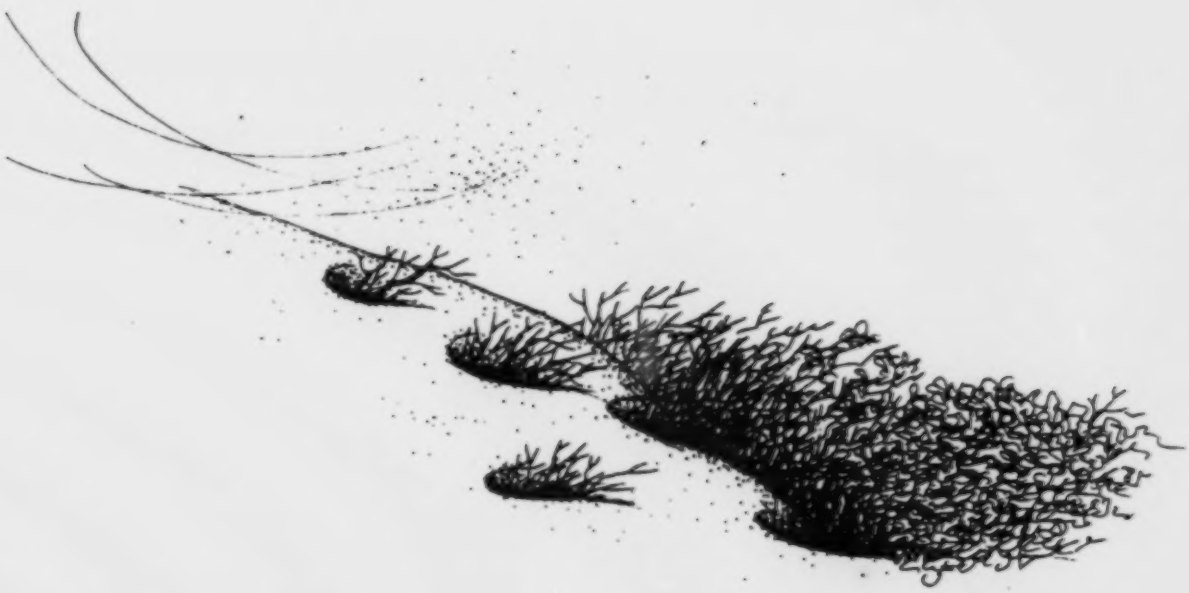
- Resource management
- Endangered species

Learning Skills:

- Interpreting data, inferring, predicting, communicating
- Averaging, graphing, using statistics
- Analyzing and applying information

Objectives:

- Calculate correctly the incubation period and hatching success for individual turtle nests.
- Calculate averages for turtle nests on Bear Island in 1992, such as average hatching success, average number of eggs laid, average number of eggs hatched, and average incubation period.
- List at least three factors affecting hatching success such as weather, time of year, location of nest, and predators.
- Using turtle nesting data, recommend management strategies for nesting beaches along the North Carolina coast.



Correlation Chart

Note to classroom teachers: The following Correlation Chart shows how each activity in this Environmental Education Learning Experience (EELE) correlates with the North Carolina Department of Public Instructioh (DPI) objectives in science, mathematics, social studies and English language arts. The activities are listed in the order in which they appear in this EELE. The recommended grade levels are listed along the side of the chart. Notice that only the objective numbers are listed. Use your DPI Teacher Handbook for each subject area to get a complete description of the objectives in that subject area.

Pre-Visit Activity #1: A Sea Turtle Tale, p. 3.1.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	1.1, 4.4, .5.3	2.1		
6	1.1, 4.2, 6.2, 6.3	2.1		
7	1.1, 4.2, 6.8	2.1		
8	1.1, 4.2, 6.6	2.1		

Pre-Visit Activity #2: Turtle Key, p. 3.2.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	2.1, 2.2, 2.4, 2.10, 4.1, 4.3, 6.1	1.1, 1.2, 1.3, 2.1, 2.2, 2.3		
6	2.1, 2.2, 2.4, 2.10, 4.1, 4.3, 6.1	1.1, 1.2, 1.3, 2.1, 2.2, 2.3		
7	2.1, 2.2, 2.4, 2.10, 4.1, 4.3	1.1, 1.2, 1.3, 2.1, 2.2, 2.3		
8	2.1, 2.2, 2.4, 2.10, 4.1, 4.3, 6.7	1.1, 1.2, 1.3, 2.1, 2.2, 2.3		

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Correlation Chart

Pre-Visit Activity #3: Reptile Relative, p. 3.3.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	2.2, 2.4, 2.6, 5.3	2.2, 2.3, 4.3		
6	**2.2, 2.4, 2.6, 5.1, 6.1, 6.3**	**2.2, 2.3, 4.3**		
7	2.2, 2.4, 2.6, 5.1, 6.8	2.2, 2.3, 4.3		
8	**2.2, 2.4, 2.6, 5.1, 6.6, 6.7**	**2.2, 2.3, 4.3**		

On-Site Activity #1: Lost Habitat, p. 4.1.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	2.1, 2.2, 2.4, 2.6, 2.7, 4.1, 4.2, 4.3, 5.3, 5.4	3.1, 3.2, 3.3	2.3, 5.1, 5.2, 5.3, Skill Goals I, II & III	
6	**2.1, 2.2, 2.4, 2.6, 2.7,4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.3**	**3.1, 3.2, 3.3**		
7	2.1, 2.2, 2.4, 2.6, 2.7,4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.8	3.1, 3.2, 3.3		
8	**2.1, 2.2, 2.4, 2.6, 2.7, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 6.6**	**3.1, 3.2, 3.3**	**1.3, 2.2, 11.2 Skill Goals I, II & III**	

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Correlation Chart

On-Site Activity #2: Talking Turtle, p. 4.2.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	1.1, 1.2, 2.4, 4.1, 4.2, 5.3, 5.4	2.1		
6	**1.1,1.2, 2.4, 4.1, 4.2, 5.1, 5.2, 6.2, 6.3**	**2.1**		
7	1.1, 1.2, 2.4, 4.1, 4.2, 5.1, 5.2, 6.8	2.1		
8	**1.1, 1.2, 2.4, 4.1, 4.2, 5.1, 5.2, 6.6, 6.7**	**2.1**		

On-Site Activity #3: Crawl For Life, p. 4.3.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 2.11, 2.14, 4.1, 4.2, 4.3, 5.3, 5.4	4.1, 4.2, 4.3	5.2, 5.3, Skill Goals III & IV	6.1, 6.2, 6.6
6	**1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 2.11, 2.14, 4.1, 4.2, 4.3, 5.1, 6.3**	**4.1, 4.2, 4.3**		**6.1, 6.4, 6.5, 6.6, 6.7**
7	1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 2.11, 2.14, 4.1, 4.2, 4.3, 5.1, 6.8	4.1, 4.2, 4.3		6.1, 6.4, 6.8
8	**1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 2.11, 2.14, 4.1, 4.2, 4.3, 5.1, 6.6, 6.7**	**4.1, 4.2, 4.3**	**1.3, 2.2 Skill Goals III & IV**	**6.1, 6.4, 6.5, 6.6**

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Correlation Chart

Post-Visit Activity #1: Sea Turtle Trek, p. 5.1.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	2.4, 4.2, 5.3, 5.4	2.3		
6	2.4, 4.2, 5.1, 6.2, 6.3	2.3		
7	2.4, 4.2, 5.1, 6.8	2.3		
8	2.4, 4.2, 5.1, 6.6	2.3		

Post-Visit Activity #2: Turtle Tag, p. 5.2.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.1, 4.2, 4.3, 5.3, 5.5	2.2, 2.3	2.3, 3.1, 4.1, 4.2, 5.2, 5.3, 6.1, Skill Goals I & II	4.5, 4.6, 5.1, 5.2, 5.4, 5.5, 7.1
6	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.3	2.2, 2.3		4.1, 5.1, [illegible] 7.1, 7.2
7	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.8	2.2, 2.3	1.1, 1.2, 1.3, 11.2, Skill Goals I & II	4.1, 4.2, 5.1, 5.2, 5.4, 5.5, 7.1, 7.2, 7.3, 7.5
8	1.1, 1.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.6	2.2, 2.3		4.1, 5.1, [illegible] 5.4, 5.5, 7.5

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Correlation Chart

Post-Visit Activity #3: Nest Management, p. 5.3.1

Grade	Science	English Lang. Arts	Soc. Studies	Mathematics
5	1.1, 1.2, 1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 4.1, 4.2, 4.3, 5.3, 5.4	2.2, 2.3		5.1, 5.4, 5.5, 5.6, 5.7, 6.2, 6.3, 6.4, 6.6, 7.3, 7.13
6	1.1, 1.2, 1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.2, 6.3	2.2, 2.3		5.1, 5.2, 5.4, 6.1, 6.2, 6.4, 6.5, 7.1, 7.2, 7.8, 7.10
7	1.1, 1.2, 1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.8	2.2, 2.3		5.1, 5.2, 5.3, 5.6, 6.1, 6.4, 7.1, 7.2, 7.3, 7.4, 7.5
8	1.1, 1.2, 1.5, 2.3, 2.4, 2.6, 2.7, 2.9, 4.1, 4.2, 4.3, 5.1, 5.2, 6.6	2.2, 2.3		5.1, 5.2, 5.4, 5.5, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1

Pre-Visit Activity #1 — A Sea Turtle Tale

Curriculum Objectives:
Grade 6
- Communications Skills: reading, vocabulary and viewing comprehension, study skills using environmental sources
- Science: ecology, how science helps us
- Social Studies: gather, organize and analyze information

Grade 7
- Communications Skills: reading, vocabulary and viewing comprehension, study skills using environmental sources
- Science: characteristics of animals, organization and variety of living things, interaction of people and the environment, earth science
- Social Studies: gather, organize and analyze information, know the importance of natural resources

Grade 8
- Communications Skills: reading, vocabulary and viewing comprehension, study skills using environmental sources
- Science: adaptations, ecology

Location: Classroom

Group Size: 30 or less

Estimated Time: 30 minutes

Appropriate Season: Any

Materials:
Provided by educator:
Per student: "Sea Turtle Jargon" worksheet, "Turtle Encounter" story

Major Concepts:
- Sea turtle life history
- Resource management

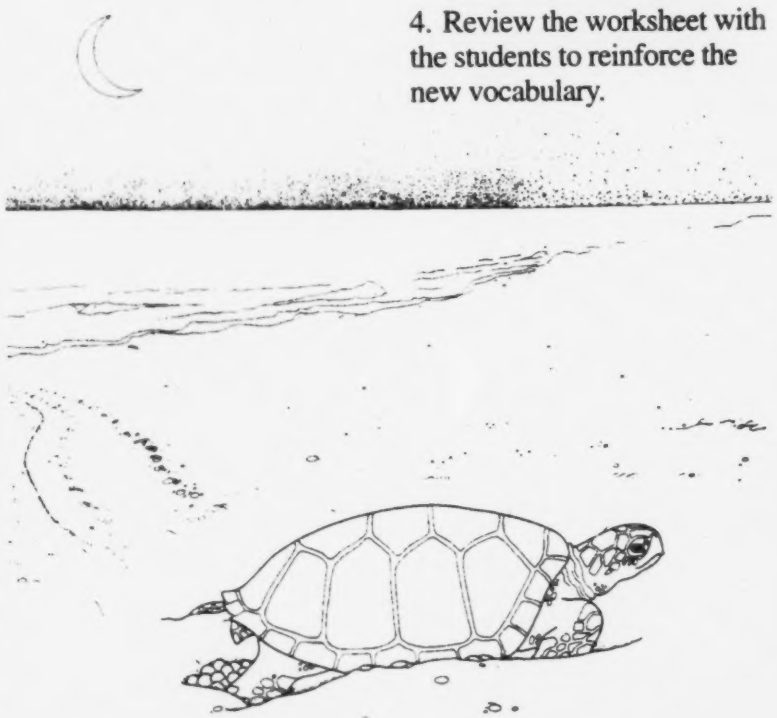
Objectives:
- Name the most common sea turtle that nests on North Carolina's beaches.
- Explain two aspects of the park's resource management program.
- Learn 10 new vocabulary words by recalling them from a story.
- Describe the life cycle of a loggerhead sea turtle.

Educator's Information:

In this activity, the loggerhead sea turtle's natural history will be used to introduce students to new terminology and basic vocabulary words which will be used throughout this Environmental Education Learning Experience. For loggerhead sea turtle information, see Appendix 2.

Instructions:

1. Photocopy the Turtle Encounter story and Sea Turtle Jargon worksheet, one copy per student.
2. Hand out the story and have the students read it.
3. Hand out the worksheet and have the students complete it.
4. Review the worksheet with the students to reinforce the new vocabulary.

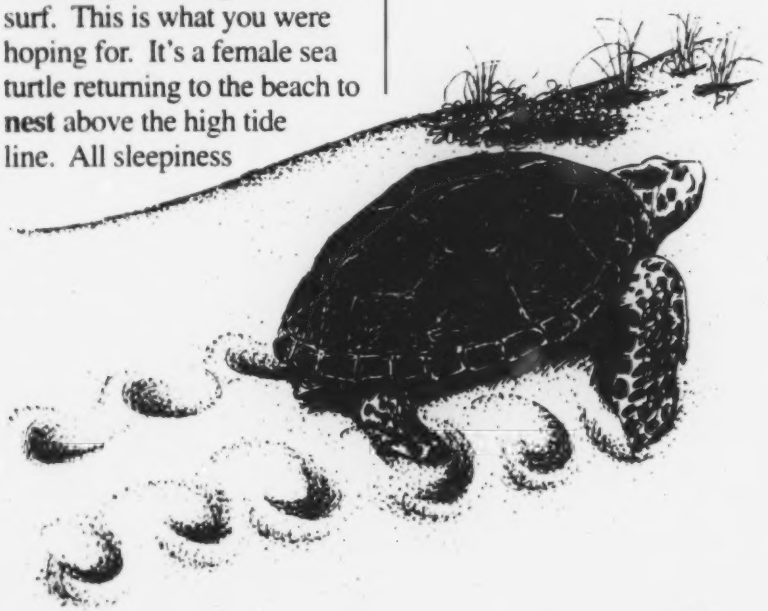


Turtle Encounter

A slight breeze is blowing from the south, causing the sea oats to rustle in the dunes. The black sky seems to emphasize the brilliance of the many stars visible to the naked eye; among them, the constellation Hercules can be seen high in the summer sky to the east. But you're not here to look at stars. You scan the surf, resisting the hypnotic effects of the constant motion and gentle pounding of the surf which could put anyone to sleep. It's 10:15 p.m. As if trying to help keep you awake, a mosquito occasionally lights on your ear, distracting your focus from the waves.

Suddenly, you think you see a dark object down the **beach** several hundred yards. By the red beam of the ranger's special flashlight you see it's a **loggerhead** sea turtle, methodically crawling out of the surf. This is what you were hoping for. It's a female sea turtle returning to the beach to **nest** above the high tide line. All sleepiness forgotten, you quietly watch as the turtle makes its way onto the beach. It is important not to use white lights and to remain still, as any noise and movement may frighten her back into the water. You know this because the park ranger with you gave a program on loggerhead sea turtles prior to bringing your group out to the beach.

The large, reddish-brown loggerhead turtle, you recall from the program, weighs between 200 and 350 pounds. Its name comes from its large head, which always extends out from its shell. The shell, or **carapace**, measures about three feet in length. In comparison, a huge **leatherback** sea turtle can weigh about 1300 pounds and measure six feet in length.

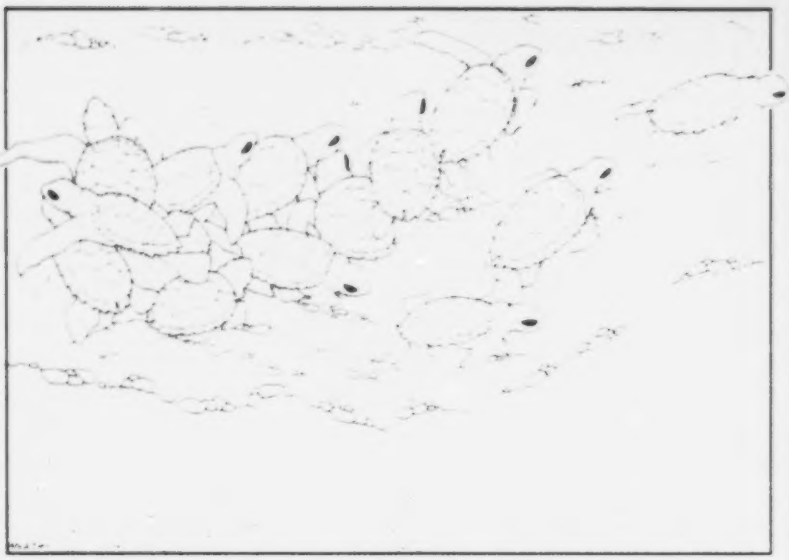


The park ranger showed you many pictures of loggerhead turtles as part of the **resource management** activities at the park. Every turtle that nests at the park is photographed and marked with a tag. Records of tagged turtles are kept, to monitor them from year to year. The ranger also explained that the park is a **sanctuary** for the loggerhead sea turtle and other animals and plants, making it a safe, protected place to nest and live.

You know from the ranger's talk that the loggerhead has a **range** which is worldwide within **temperate** and subtropical waters. Nesting occurs from May to September in the northern hemisphere. In North America, most nests are found in Florida. The major nesting sites in North Carolina are found on barrier islands, such as Bear Island, buffering the coast.

The tracks, or **crawl**, made by a nesting loggerhead sea turtle can be distinguished by the pattern of alternate flipper marks found from the surf to the dune line and back.

You sit and watch in quiet amazement as she uses her rear **flippers** to dig a pear shaped cavity in which she lays her **eggs**. The ranger said she will probably lay a **clutch** of about 120 ping-pong ball shaped eggs, and that if conditions are right, you might see tears run



down the turtles cheeks, washing sand from her eyes. She's not sad; these tears help remove excess salt from her body.

You remember that the ranger said, the eggs will incubate for a period of approximately 60 days in the nest. Unfortunately, many bad things may happen to the nest. A summer storm could wash over it or raccoons might find the nest and eat the eggs.

The **hatchlings**, each two inches long, will emerge from the nest all at once to reduce the number of deaths from **predators**, such as **ghost crabs**. They will know the direction of the ocean because it's the brightest place visible from the starlight reflecting off the water, and they will instinctively move toward the area with the most light. Many turtles don't make it to the ocean as they are attracted to bright light from recent development on or near our beaches.

Not many of the hatchlings will make it through the first year, as several will be eaten by gulls and fish. Some may be caught in fishing nets or tangled in trash. It's estimated that 11,000 sea turtles drown each year in shrimp nets along the Atlantic and Gulf coasts. To save turtles from drowning, shrimp trawlers must use a **turtle excluder device** (**TED**) to reduce the number of deaths. This device permits the sea turtles to escape the nets through a trap door. All these threats have caused the **reptile** to become a **threatened** species.

Although you're not aware of time passing, the whole process takes about one-and-a-half hours. Before returning to the sea, she uses her flippers to push sand into the nest to fill the hole and disguise its location. After covering her nest, the turtle slowly lumbers down to the surf, covered with sand from her nest building activities. As she lumbers away, the ranger reminds you that she may return again to lay several more nests this summer.

It's 11:45 p.m. You have just experienced one of nature's wonders. Once more, all you hear the gentle roll of the surf. The wind slowly dies down. A mosquito buzzes your ear, and reminds you it's time for you to return to your own home.

Sea Turtle Jargon

Instructions:
List below all the words shown in bold in the story. Find each of the words in the word search puzzle. Words may appear diagonally, horizontally and vertically. Fill in the sentences on the following page with the appropriate words.

O E T C A R A P A C E G T C H R R T O W F G W P
B J Q E L U O A D G J L X V N M E E Z K H F S O
A D G J L U H F S Q E T U O P I Y P P Y C B M N
P C Z Q Z E T T B T M M N B V C C L U T C H G F
L B U T E Q Q W E E T Y U I O P A G U I I H J R
P R E S O U R C E M A N A G E M E N T J L L N Y
R K O A J I C H U P Y X F T D R S E C W Q E E O
F Q Y F C T D C U E I B V E P W G H H Q O A I K
R E U R Y H L A K R J D H D G M Z N X N C T V J
N P Z O X I C U V A B T N R M E L W K Q J H H L
E M A N S B D B F T X E Z K J Q P W O E I E U O
G P A N F L I P P E R S I C H A N G E L I R G G
G H O S T C R A B S I E O W R A N G E T G B F G
S M N B V C X Z L K J H G F D S T P O I U A T E
N A L E K D J F J G H Z M X N C R C W L P C O R
W R G H S J D K S L A Z M X N C B V H Q O K I H
U A U R T T G H B C V M F J R I O E L L M C N E
P N M N B V C X Z P R E D A T O R S D F I H J A
I G P O I U Y T R E W A L K T H R E A T E N E D
S A N C T U A R Y U I O W A S D F G H J K L G N
V C X Z L K J H G F D S A L O I U Y T R E W Q S

1. The most common species of sea turtle found in waters off North Carolina is the _____. Its name comes from this species' large head. Another sea turtle occasionally seen in this area is the _____.

2. In North America, sea turtles nest on a sandy _____. Nesting activity is easily recognized by the _____ in the sand. Human disturbances such as beach front development, excessive off-road vehicle use, artificial lighting and seawalls can lead to a drastic reduction in nesting sea turtles.

3. Loggerhead sea turtles lay ping-pong ball sized _____.

4. The _____, or mass of eggs, laid by a female loggerhead sea turtle averages 120 in North Carolina.

5. _____ are one of the primary _____ of young sea turtles as they leave the nest and scramble towards the ocean.

6. Due to the many predators on both land and sea, very few _____ survive to become adult sea turtles. Some scientists estimate as few as 1 in 10,000 make it to adulthood.

7. Sea turtles are a type of _____.

8. Loggerhead sea turtles have a _____ which is worldwide in the _____ and subtropical waters.

9. Female turtles may _____ several times during one summer but may wait two or three years before nesting again.

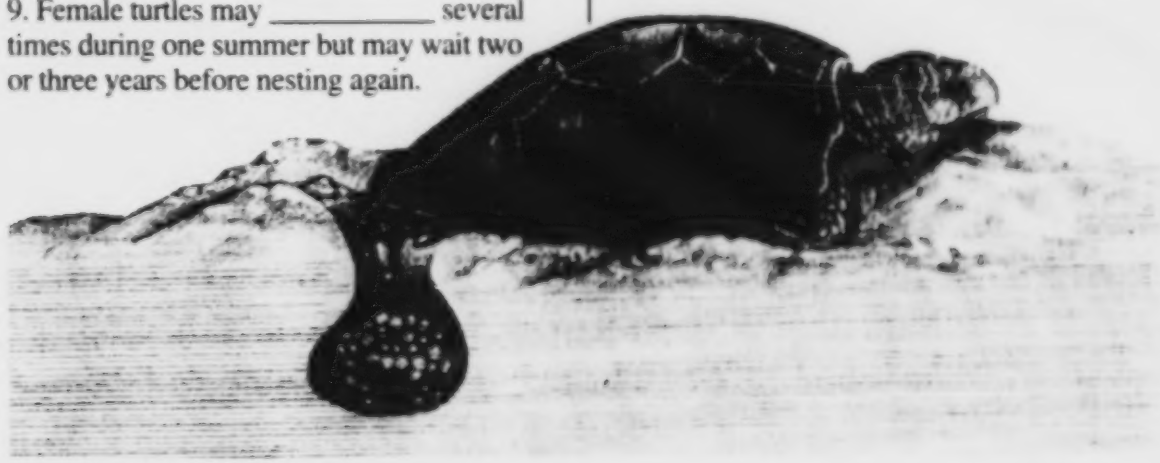
10. Female loggerheads dig a nest in the sand by using their rear _____ to scoop out a pear shaped hole averaging 12 - 18 inches deep. They deposit their eggs and then cover the nest with sand before returning to the ocean.

11. The _____ is a section of netting or a cage-like device placed inside a shrimp trawl that causes large objects, such as sea turtles or jellyfish, to be forced up through a trap door and out of the shrimp net. Scientists believe that if these were used throughout the southeastern U.S. shrimp fishery, a major cause of death of adult sea turtles would be eliminated. (It is estimated that up to 11,000 sea turtles drown each year in shrimp nets along the Atlantic and Gulf Coasts.)

12. The loggerhead shell, or _____, is reddish brown in color and can be approximately 38 inches in length.

13. Park rangers, scientists and other researchers use _____ _____ to learn more about the sea turtles and protect their habitat. They believe the more we know about this _____ species the more likely we are to be able to protect and save it.

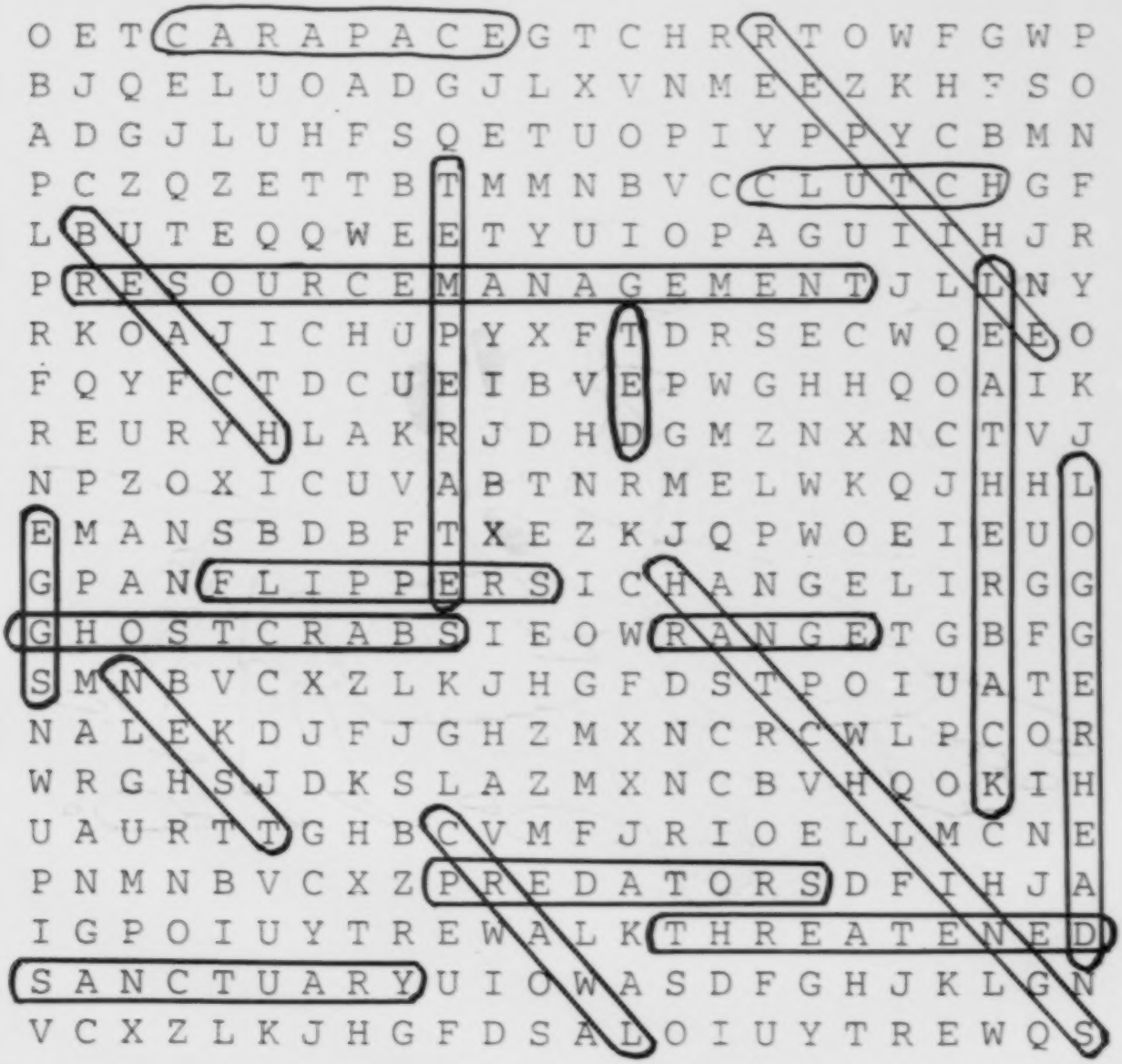
14. Hammocks Beach is a _____, where sea turtles are protected from hunting and molestation.



Sea Turtle Jargon Answer Sheet

Instructions:
List below all the words shown in bold in the story. Find each of the words in the word search puzzle. Words may appear diagonally, horizontally and vertically. Fill in the sentences with the appropriate words.

Beach	*Hatchlings*	*Resource Management*
Carapace	*Leatherback*	*Sanctuary*
Clutch	*Loggerhead*	*TED*
Eggs	*Nest*	*Temperate*
Flippers	*Predators*	*Threatened*
Ghost Crabs	*Range*	*Crawl*
	Reptile	


O E T C A R A P A C E G T C H R R T O W F G W P
B J Q E L U O A D G J L X V N M E E Z K H F S O
A D G J L U H F S Q E T U O P I Y P P Y C B M N
P C Z Q Z E T T B T M M N B V C C L U T C H G F
L B U T E Q Q W E E T Y U I O P A G U I I H J R
P R E S O U R C E M A N A G E M E N T J L L N Y
R K O A J I C H U P Y X F T D R S E C W Q E E O
F Q Y F C T D C U E I B V E P W G H H Q O A I K
R E U R Y H L A K R J D H D G M Z N X N C T V J
N P Z O X I C U V A B T N R M E L W K Q J H H L
E M A N S B D B F T X E Z K J Q P W O E I E U O
G P A N F L I P P E R S I C H A N G E L I R G G
G H O S T C R A B S I E O W R A N G E T G B F G
S M N B V C X Z L K J H G F D S T P O I U A T E
N A L E K D J F J G H Z M X N C R C W L P C O R
W R G H S J D K S L A Z M X N C B V H Q O K I H
U A U R T T G H B C V M F J R I O E L L M C N E
P N M N B V C X Z P R E D A T O R S D F I H J A
I G P O I U Y T R E W A L K T H R E A T E N E D
S A N C T U A R Y U I O W A S D F G H J K L G N
V C X Z L K J H G F D S A L O I U Y T R E W Q S

1. The most common species of sea turtle found in waters off North Carolina is the loggerhead. Its name comes from this species' large head. Another sea turtle occasionally seen in this area is the leatherback.

2. In North America, sea turtles nest on a sandy beach. Nesting activity is easily recognized by the crawl in the sand. Human disturbances such as beach front development, excessive off-road vehicle use, artificial lighting, and seawalls can lead to a drastic reduction in nesting sea turtles.

3. Loggerhead sea turtles lay ping-pong ball sized eggs.

4. The clutch, or mass of eggs, laid by a female loggerhead sea turtle averages 120 in North Carolina.

5. Ghost crabs are one of the primary predators of young sea turtles as they leave the nest and scramble towards the ocean.

6. Due to the many predators on both land and sea, very few hatchlings survive to become adult sea turtles. Some scientists estimate as few as 1 in 10,000 make it to adulthood.

7. Sea turtles are a type of reptile.

8. Loggerhead sea turtles have a range which is worldwide in the temperate and subtropical waters.

9. Female turtles may nest several times during one summer but may wait two or three years before nesting again.

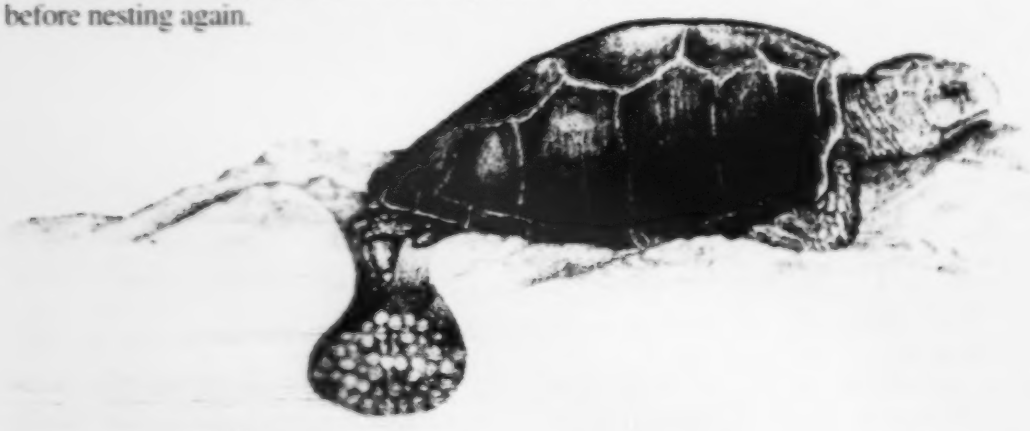
10. Female loggerheads dig a nest in the sand by using their rear flippers to scoop out a pear shaped hole averaging 12 - 18 inches deep. They deposit their eggs and then cover the nest with sand before returning to the ocean.

11. The TED is a section of netting or a cage-like device placed inside a shrimp trawl that causes large objects, such as sea turtles or jellyfish, to be forced up through a trap door and out of the shrimp net. Scientists believe that if these were used throughout the southeastern U.S. shrimp fishery, a major cause of death of adult sea turtles would be eliminated. (It is estimated that up to 11,000 sea turtles drown each year in shrimp nets along the Atlantic and Gulf Coasts.)

12. The Loggerhead shell or carapace is reddish brown in color and can be approximately 38 inches in length.

13. Park rangers, scientists and other researchers use resource management to learn more about the sea turtles and protect their habitat. They believe the more we know about this threatened species the more likely we are to be able to protect and save it.

14. Hammocks Beach is a sanctuary, where sea turtles are protected from hunting and molestation.



Pre-Visit Activity #2 — Turtle Key

Major Concepts:
- Taxonomy
- Sea turtle anatomy
- Dichotomous key

Learning Skills:
- Observing, classifying and communicating
- Reading informational material (scientific keys)

Subject Areas:
- Science
- English Language Arts
- See **Activity Summary** for a Correlation with DPI objectives in these subject areas.

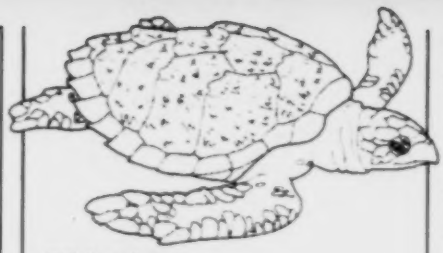
Location: Classroom

Group Size: 30

Estimated Time:
30 to 45 minutes

Appropriate Season: Any

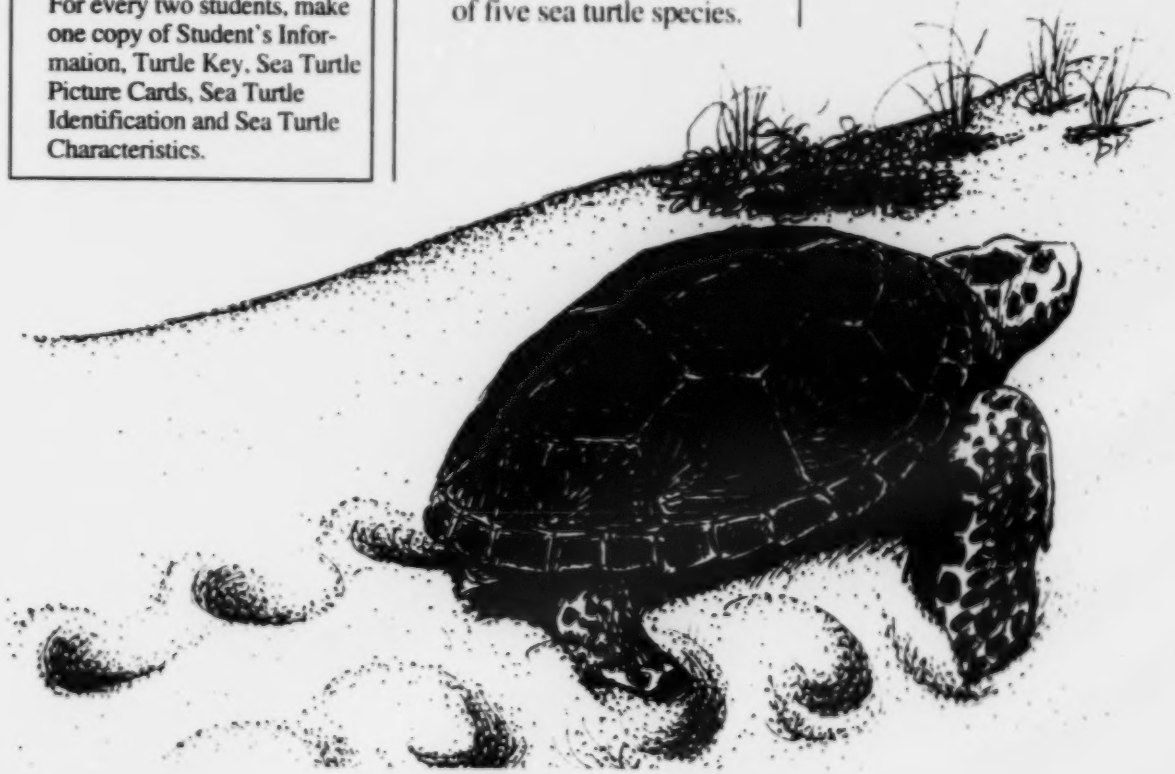
Materials:
Provided by educator:
For every two students, make one copy of Student's Information, Turtle Key, Sea Turtle Picture Cards, Sea Turtle Identification and Sea Turtle Characteristics.



Objectives:
- Give an operational definition of taxonomy.
- List the names of three different types of scutes that are used to classify sea turtle species.
- On a diagram of sea turtle external anatomy, identify the correct location of plastron, carapace, inframarginal scutes, lateral scutes, and prefrontal scutes.
- Use a dichotomous key to correctly identify pictures of five sea turtle species.

Educator's Information:

This activity introduces students to taxonomy, anatomy, and the use of a simple dichotomous key. Familiarize yourself with the Student's Information, especially the vocabulary words describing the sea turtle's anatomy. Practice using the Turtle Key with each Sea Turtle Picture Card so that you can anticipate areas where students may have difficulty.



Instructions:

1. Divide the students into teams of two for this activity. Ask them to read the Student's Information and study the accompanying diagram of sea turtle external anatomy. They should also preview the Turtle Key by skimming for new vocabulary words. The teacher should use the sea turtle diagram on the Sea Turtle Identicafication sheet to give a step-by-step demonstration of how to read the Turtle Key. (This diagram depicts a loggerhead sea turtle.)

2. Give each team the Sea Turtle Picture Cards and ask them to cut the cards on the dotted lines. They will work together to identify the sea turtle species shown on each card. Students should write the name of the sea turtle on the front of each card. On the back of each card, they should write their choices at each level of the key.

3. As the teams complete their identification work, give them the Sea Turtle Characteristics sheet. They should use this sheet and the Turtle Key to decide if they have correctly identified their turtle cards. The teacher should review the correct answers and discuss the use of the key. Was the key easy to use? What caused the greatest difficulty in using the key?

4. Students could be divided into five groups to give a summary of the external anatomy of each of the five sea turtle species found along the North Carolina coast. (The teacher could combine two or three teams into a larger group for these presentations.) Each group should describe to the class what makes their turtle species unique. If their turtle were crawling on the beach, what characteristics would they observe in order to identify it quickly and correctly? If desired, the students could research the adaptations of their turtle species and explain to the class how these adaptations have helped their turtle survive.

Extensions:

1. Research the internal anatomy of the sea turtle and compare/contrast with the internal anatomy of humans. Does the sea turtle have body systems and tissues similar to a human? Draw a diagram or make a chart noting the similarities and differences.

2. Research the geographical ranges of the five sea turtle species. Mark their ranges and/or nesting areas on a map of North and Central America. (A hurricane tracking map could be used).

laughing gull

Student's Information

Taxonomy is the branch of biology that deals with **classification** of **organisms** into established categories. The word *taxonomy* comes from the Greek words meaning arrangement and law. By following certain rules of taxonomy, biologists have arranged known organisms into related groups. The biologists carefully observe an organism's anatomy, genetics, ecology, and distribution before placing it into a specific category or group.

All organisms are first divided into large groups known as kingdoms. There are five widely-recognized kingdoms: Monera, Protista, Fungi, Plantae, and Animalia. Each kingdom is then split into smaller and smaller groupings, with **species** (or subspecies) being the smallest grouping of all.

Keys:

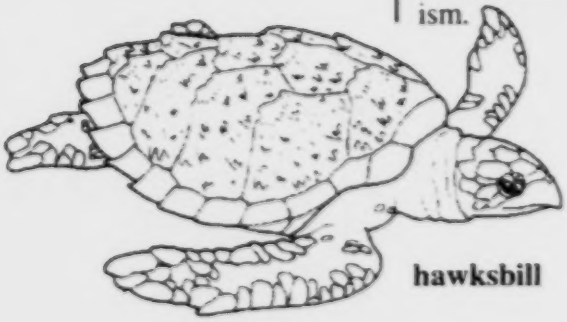
A **key** is an essential tool in the science of taxonomy. Biologists, students and others use keys to help them identify unknown organisms. A key is an ordered list of characteristics that describe organisms. Keys often specialize in a particular type of organism such as flowering plants, freshwater fish, or sea turtles. Keys usually contain pictures and drawings, as well as written descriptions, to guide the reader to the correct name for the unknown organism.

Dichotomous Keys:

Most keys are **dichotomous**, meaning dividing or branching into two parts. At each level of a dichotomous key, the reader must choose from two descriptions. The reader carefully observes the unknown organism and then chooses the description in the key that best matches the organism. One choice leads to another until finally the reader reaches the name of the organism.

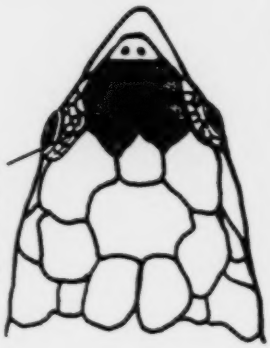
How the Turtle Key Works:

Before using the Turtle Key, you must be familiar with the terms that describe sea turtle **anatomy**. The following illustration shows and defines the key characteristics you must know in order to identify sea turtles. When you understand the words **plastron, carapace** and **scute**, you are ready to begin reading at the top of the Turtle Key. Study one of the Sea Turtle Cards that your teacher has given you. Read the two statements labelled "1" at the top of the key. If your turtle picture matches 1A, you can write Leatherback on the card. If your turtle picture matches 1B, you go to "2" or the second level of the key. You will then read 2A and 2B and decide which description best fits your picture. Your choice at level 2 will send you to either level 3 or level 4. Keep reading the key until you arrive at the name of a turtle. As you work your way through the key, you may want to take notes by listing your choices at each level on the back of the turtle card. This will help you later if you need to find problem areas in the key that may have led you to the incorrect name for your turtle.



hawksbill

Sea Turtle Identification



Prefrontal scutes
(scutes located between the eyes, shaded area)

Scute
(an enlarged scale covering the bony portion of the shell)

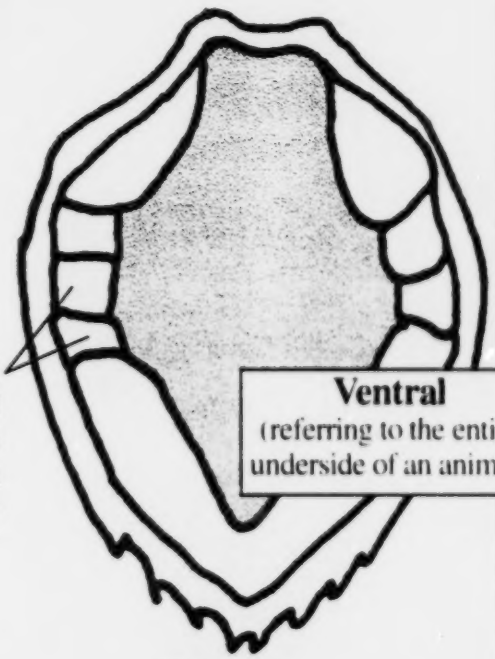
Dorsal
(referring to the entire upperside of an animal)

Lateral scutes
(scutes located on each side of the vertebral scutes on the carapace)

Marginal scutes
(outermost scutes, they enclose the lateral and vertebral scutes)

Vertebral scutes
(located on the carapace in the center between the lateral scutes)

Carapace
(top or **dorsal** part of shell, shaded area)



Inframarginal scutes
(located between the marginal scutes of the carapace and the plastron. They connect the plastron to the carapace)

Ventral
(referring to the entire underside of an animal)

Plastron
(underside or ventral part of shell, shaded area)

Turtle Key

You can use this key to identify the five Sea Turtle Picture Cards. You can also use this key to identify dead turtles you find at the beach. Remember not to disturb a nesting turtle! Dead turtles should be reported to a park official, wildlife officer or police officer.

1A. Carapace with seven vertical lines, or longitudinal ridges; no scutes on shell ..... **Leatherback**

1B. Carapace without vertical lines, or longitudinal ridges; scutes present on shell ..... **Go to 2**

2A. Four lateral scutes ..... **Go to 3**

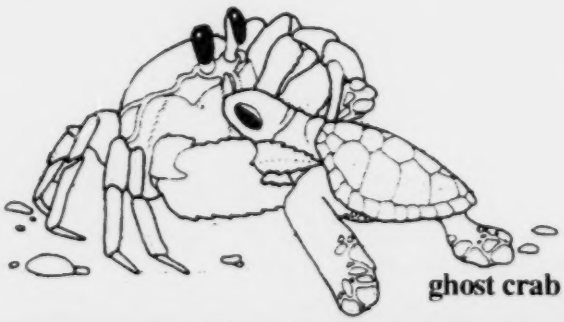
2B. Five lateral scutes ..... **Go to 4**

3A. One pair of prefrontal scutes ..... **Green**

3B. Two pairs of prefrontal scutes ..... **Hawksbill**

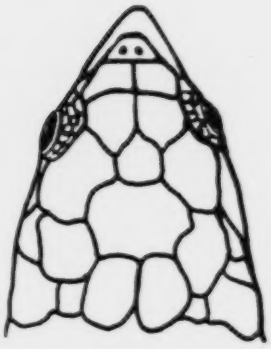
4A. Three inframarginal scutes; carapace reddish brown ..... **Loggerhead**

4B. Four inframarginal scutes; carapace greenish gray ..... **Kemp's Ridley**

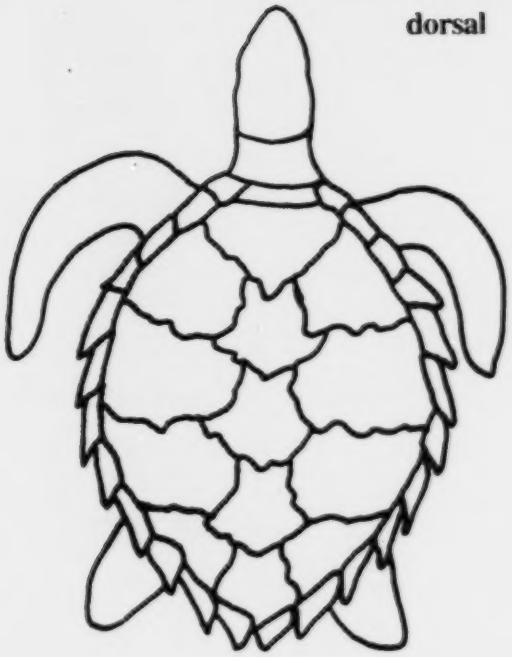


ghost crab and hatchling

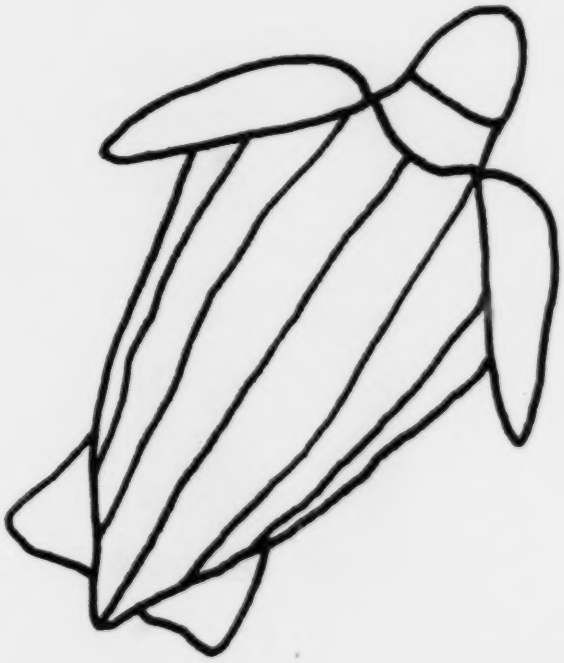
Sea Turtle Picture Cards



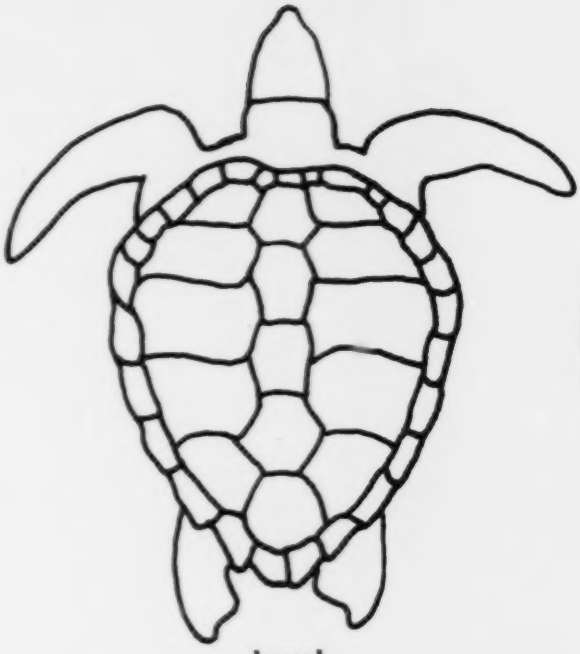
head, magnified



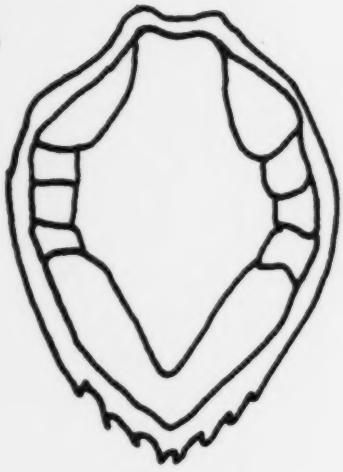
dorsal



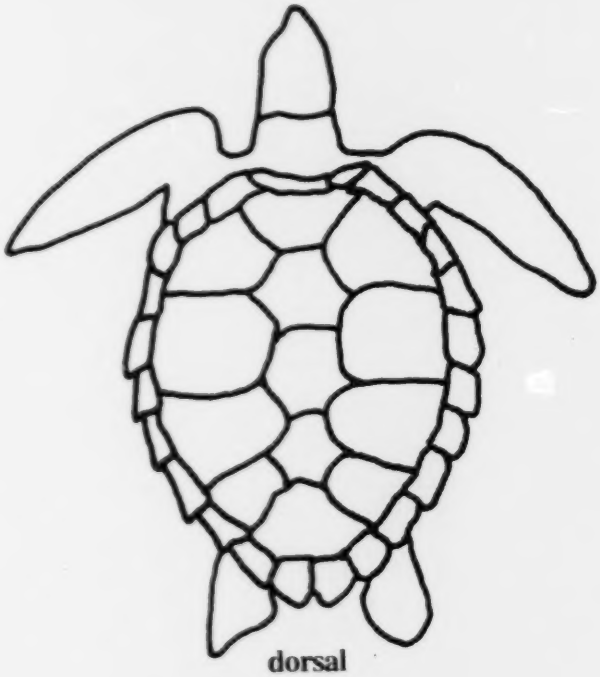
dorsal



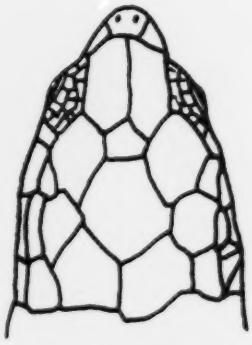
dorsal



ventral

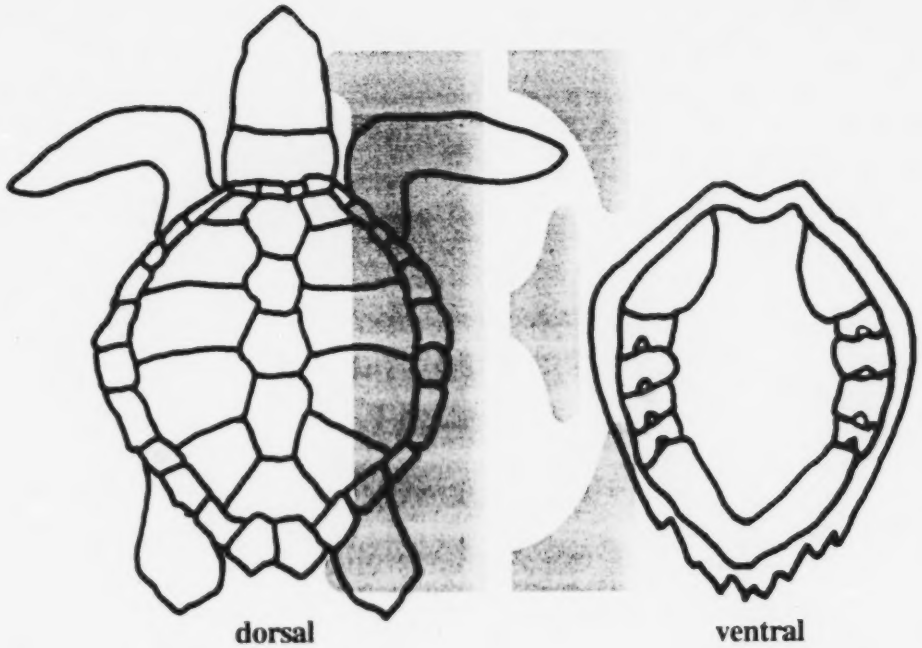


dorsal



head, magnified

Sea Turtle Picture Cards



dorsal

ventral

Sea Turtle Characteristics

After you have identified the sea turtles, write their names in the blanks.

Species A _____

- small – adults weigh 80-280 lbs.
- two pair prefrontal scutes between the eyes
- vertebral scutes usually overlap, except in very young and very old
- four lateral scutes
- two claws on front flipper
- habitat – tropical seas, rare in North Carolina

Species B _____

- carapace with seven longitudinal ridges
- no scutes on head or shell
- carapace black; leathery skin covering carapace
- largest reptile in the world-weighs as much as 1,400 lbs
- feeds mainly on jellyfish including Portuguese man-o-war
- habitat – tropical but wandering as far north as Nova Scotia, Canada

Species C _____

- more than one pair of prefrontal scutes between the eyes
- reddish brown carapace
- three inframarginal scutes
- five lateral scutes
- very large head
- habitat – tropical to subtropical, nest from North Carolina south

Species D _____

- one pair of prefrontal scutes
- one claw on each front flipper
- large-may weigh up to 650 lbs or more
- four lateral scutes
- only sea turtle with tooth like projections on edge of lower jaw
- habitat – tropical seas worldwide, nest rarely from Florida to North Carolina

Species E _____

- carapace grayish, as wide as it is long
- five or more lateral scutes
- four inframarginal scutes that have small pores at their base
- more than one pair of prefrontal scutes
- smallest of the sea turtles, up to 110 lbs
- breeds in large groups during the daytime

Sea Turtle Characteristics Answer Sheet

After you have identified the sea turtles, write their names in the blanks.

Species A ***Hawksbill sea turtle***

- small – adults weigh 80-280 lbs.
- two pair prefrontal scutes between the eyes
- vertebral scutes usually overlap, except in very young and very old
- four lateral scutes
- two claws on front flipper
- habitat – tropical seas, rare in North Carolina

Species B ***Leatherback sea turtle***

- carapace with seven longitudinal ridges
- no scutes on head or shell
- carapace black; leathery skin covering carapace
- largest reptile in the world-weighs as much as 1,400 lbs
- feeds mainly on jellyfish including Portuguese man-o-war
- habitat – tropical but wandering as far north as Nova Scotia, Canada

Species C ***Loggerhead sea turtle***

- more than one pair of prefrontal scutes between the eyes
- reddish brown carapace
- three inframarginal scutes
- five lateral scutes
- very large head
- habitat – tropical to subtropical, nest from North Carolina south

Species D ***Green sea turtle***

- one pair of prefrontal scutes
- one claw on each front flipper
- large-may weigh up to 650 lbs or more
- four lateral scutes
- only sea turtle with tooth like projections on edge of lower jaw
- habitat – tropical seas worldwide, nest rarely from Florida to North Carolina

Species E ***Kemp's Ridley sea turtle***

- carapace grayish, as wide as it is long
- five or more lateral scutes
- four inframarginal scutes that have small pores at their base
- more than one pair of prefrontal scutes
- smallest of the sea turtles, up to 110 lbs
- breeds in large groups during the daytime

Pre-Visit Activity #3 — Reptile Relatives

Major Concepts:
- Adaptations
- Anatomy
- Natural history

Learning Skills:
- Classifying, communicating, inferring
- Participating effectively in groups
- Organizing information

Subject Areas:
- Science
- English Language Arts
- See the **Activity Summary** for a Correlation with the DPI objectives in these subject areas.

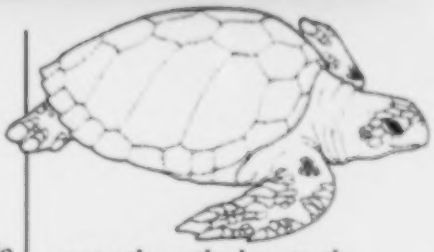
Location: Classroom or schoolyard

Group Size: Maximum of 30 students

Time: 45 - 60 minutes

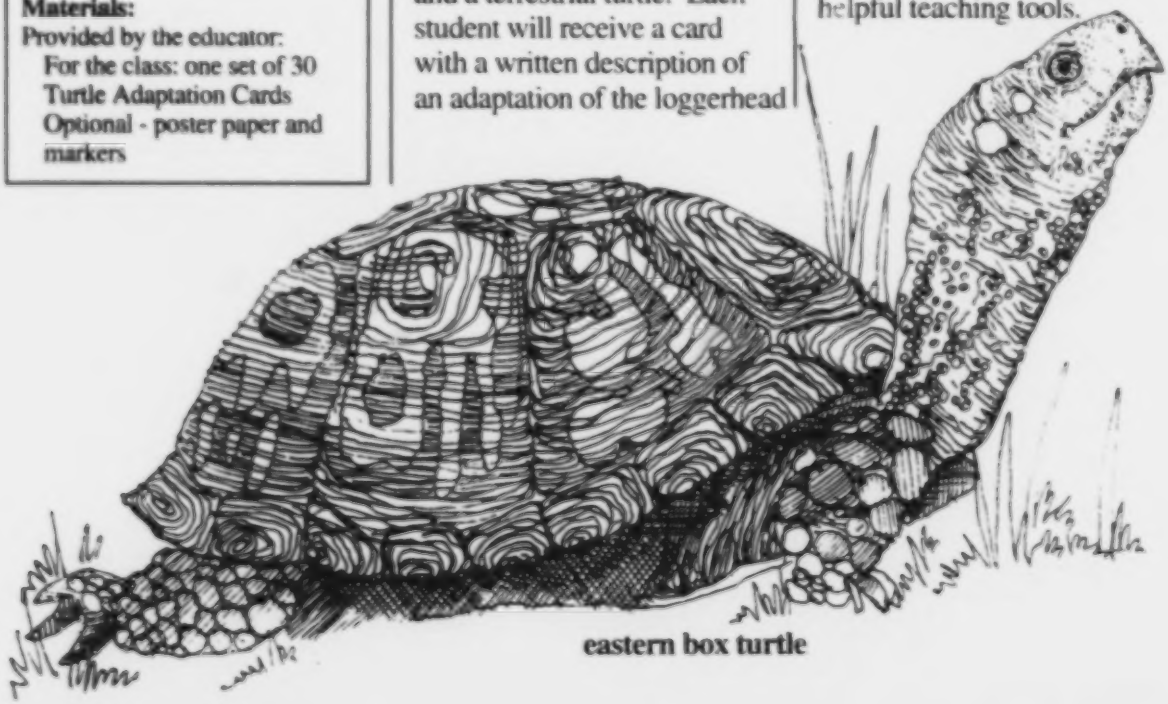
Materials:
Provided by the educator:
For the class: one set of 30 Turtle Adaptation Cards
Optional - poster paper and markers

Objectives:
- List five adaptations that allow the loggerhead sea turtle to survive in the marine environment.
- List five adaptations that allow the eastern box turtle to survive in a terrestrial environment.
- Identify similarities and differences between the loggerhead sea turtle and eastern box turtle.
- Give at least two reasons why the sea turtle is endangered and the box turtle is not.



Educator's Information:

In this activity, the students will become familiar with the adaptations, anatomy and natural history of a sea turtle and a terrestrial turtle. Each student will receive a card with a written description of an adaptation of the loggerhead sea turtle or the box turtle. The students will read their information cards to one another and sort themselves into two groups. They will work with their group to give a brief natural history of their turtle to the class. Then they will assist the teacher in filling out a chart comparing the two turtles. The teacher should be familiar with the information on sea turtles in Appendix 1 in addition to the information presented on the adaptation cards in this activity. Posters or pictures from a book that illustrate the two species would be very helpful teaching tools.



eastern box turtle

Instructions:

1. Copy the Turtle Adaptation Cards and cut them along the dotted lines to make 30 cards. Shuffle the cards and then give each student one card. Tell the students that they each have a description of a turtle adaptation on their card. The adaptation helps the turtle to survive in its habitat. They are to find, and stand next to, other students whose cards are describing adaptations of the same turtle. They can not show their cards to anyone, but must read the information to another student when requested. Give the students a time limit, such as three minutes, to perform this task. Tell the students that there will be two groups, representing two types of turtles. Let them make inferences about their turtle's identity, from the facts on the cards.

2. After you call time, ask the students to work together as a group to develop a class presentation on their turtle. They will draw their animal on the board (or on a piece of poster paper) using the clues given on the cards. They should also physically group themselves into paragraphs or themes by placing students with related adaptation cards side-by-side. In this way, their oral presentation will be easy to understand, rather than just a jumble of facts. Remind them that only the student holding the card may read or tell about the information on that card. This will ensure that everyone participates in the presentation. Again, set a time limit of 15-20 minutes to prepare for their presentations. The presentations can take various forms... skit, lecture, song, poem, rap, etc.

3. The students will work with their group to present the adaptations and natural history of the turtle their group represents. When each group has finished, let the students know that the cards were supposed to represent a loggerhead sea turtle or an eastern box turtle.

4. To summarize the differences between the loggerhead and the box turtle, make a large chart on the blackboard or overhead projector. Divide the chart vertically into two sections: box turtle and loggerhead. Along the left margin, list topics such as habitat, size, colors, feet, shape of shell, predators, food, water, body temperature, and reproduction. Using the information on their cards, the students should assist the teacher in completing the chart. How are the two turtles similar? How are they different? Which is an endangered or threatened species and why? (The teacher may want to xerox copies of Appendix 1 so that students can read more about the reasons for sea turtle decline.)

Students should make inferences based on facts concerning why the sea turtle is endangered and the box turtle is not. What role do humans play in the endangered status of sea turtles?

As an adult my average weight is around 350 pounds and I am usually over 3 feet long. My large size deters most predators and helps retain my body heat.

I am cold blooded or **ectothermic,** which means I have no control over my body temperature. In other words I depend on outside sources of heat to maintain my body temperature. This is one reason that I am normally only found in **temperate** and **subtropical** (warm) waters.

The top part of my shell, or **carapace**, is somewhat flattened or streamlined to help me swim easily with less resistance. **Scutes** (large scales) cover my shell. The rear edge of my shell is particularly thick, which may offer some protection from sharks because I am not a very fast swimmer.

Even though I spend most of my life in the water I do not have gills. I have lungs. I can hold my breath for several hours. During long periods underwater, my metabolic rate slows and my heart beat drops to as low as one beat every nine minutes.

Four flippers help me move through the water and help me crawl on land. I use my long front flippers to propel myself, and my short rear ones to steer and change directions. I also use my rear ones for digging.

As an adult, I have two claws or nails on each of my flippers. Males of my species have longer tails than females. Otherwise we look about the same.

As adults we spend our entire lives in the water except in the summer months when females of our species crawl onto the beach to lay eggs. Males of my species never come out of the water unless they are trying to escape a predator.

Females lay soft, leathery, eggs that look like ping-pong balls. The leather shell prevents breakage and allows oxygen into and out of the egg. This is important for our babies because, when we finish laying the eggs, we bury them with sand!

In North Carolina, the females nest from late May to August. We nest at night, when it's cooler and safer. A **clutch** of eggs averages 120. We can lay up to nine clutches a season but three is the average.

I am a survivor! As a hatchling, I escaped from ghost crabs, raccoons, dogs, seagulls and people. So far I have managed to avoid sharks, large fish, fishing nets, boats, pollution and many other perils. It is estimated that only one out of 10,000 of my kind survives to adulthood!

As an adult I am **omnivorous,** which means I eat both plants and animals. My diet includes mollusks, crabs, jellyfish, and seaweed.

My common name comes from the fact that I have a very large head, up to 10 inches wide. My large head, combined with strong powerful jaws, helps me to crush hard-shelled animals to get to the soft body parts that are so tasty!

I do not have any teeth. Instead, I have a sharp-edged jaw with a beak at the tip. This allows me to crush shelled animals and pick out the meat with my beak.

After the nesting season, I usually **migrate** south to avoid cold weather. I may go to the Bahamas or the Caribbean to spend the winter. I usually return to the same area in North Carolina each year to mate or nest.

I get all my water through the foods I eat and the salt water I swallow. I have special glands that remove and store excess salt. I periodically excrete excess salt from these glands through tear ducts. When I do this, it looks like I am crying!

As an adult I am 4 to 6.5 inches in length. My small size and camouflage make it hard for predators to detect me.

I am cold-blooded or **ectothermic,** which means I have no control over my body temperature. In other words I depend on outside sources of heat to maintain my body temperature. This is one reason that I am not usually found above 4,000 feet in elevation in North Carolina.

The top part of my shell, or **carapace**, is dome-shaped. The bottom part of my shell, or plastron, has a hinge. This allows me to draw my head and feet inside my shell when I am threatened by a predator.

Scutes (large scales) cover my shell and are brown, yellow and orange in color. My color patterns help me blend in with the fallen leaves of the forest floor.

Being camouflaged is important for me because I do not move very fast.

Being **terrestrial**, I move by walking on four clawed feet.

I am not normally found in deep water; however, when it's hot I may seek out shallow water or mud holes to cool off.

I spend my entire life in a five to ten acre home range. I usually live 60 years or longer. Sometimes members of my species live as long as 138 years!

Females of my species dig a nest in the forest soil and lay a **clutch** of three to eight soft, leathery eggs. Up to three clutches may be laid in a season, from the months of May through July.

A long time ago, Native Americans killed my species for food and used our shells for rattles. They even buried us with their dead. Creepy! Few people kill us today, thank goodness!

Males of my species have hind claws that are shorter, stockier and more curved than the females' claws. Males also have longer thicker tails and a shallow depression on their **plastron**. Males usually, have red eyes, while females' eyes are brown.

I am **omnivorous,** which means I eat both plants and animals. My diet includes snails, slugs, beetles, worms, spiders, berries, fruit, fungi and even poisonous mushrooms that would kill most animals but not me!

A wildflower called mayapple depends on me to disperse the seeds from the lemon-colored fruit that hangs down at just the right height for me to reach up and eat.

Most animals must seek shelter or maintain a burrow, nest, or other form of shelter. Not me, I carry mine on my back! This is one reason I am able to stay on the move. I do not have to worry about shelter, just food.

I do not have teeth. Instead, I have a sharp-edged jaw that is tipped with a beak. This allows me to feed on a wide variety of plants and animals that live in the forest.

When cold weather sets in, I bury myself about two feet under loose soil and leaves to hibernate. This eliminates the need for me to travel long distances in search of warmth.

Young of my species are about the size of a quarter and are vulnerable to predators, such as snakes and raccoons, until their shells fully develop at four years of age.

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On-Site Activity #1 — Lost Habitat

Curriculum Objectives:
Grade 6
- Communication Skills: listening, reading, vocabulary and viewing comprehension, writing, speaking techniques
- Guidance: competency and skill for interacting with others, variety and complexity of occupations
- Science: ecology, how science helps us
- Social Science: gather, organize and analyze information, draw conclusions

Grade 7
- Communication Skills: listening, reading, vocabulary and viewing comprehension, speaking techniques
- Guidance: being responsible in a group, develop an awareness of alternative points of view
- Science: characteristics of animals, interaction of people and the environment, earth science
- Social Science: gather, organize and analyze information, draw conclusions, know the importance of natural resources

Grade 8
- Communication Skills: listening, reading, vocabulary and viewing comprehension, speaking techniques
- Science: science and its relationship to human endeavors, adaptation, ecology
- Social Science: gather, organize and analyze information, draw conclusions

Location: Open beach

Group Size:
Class size, divided into groups of four students

Estimated Time: 30 minutes

Appropriate Season:
April 15 - October 15
(Island trips)

Materials:
Provided by park: Wire used to protect nest site, red flashlight
Provided by educator: "Loggerhead Sea Turtle Fact Sheet" Appendix 2, worksheet and clipboards (one per student or group)
Provided by student: pencil

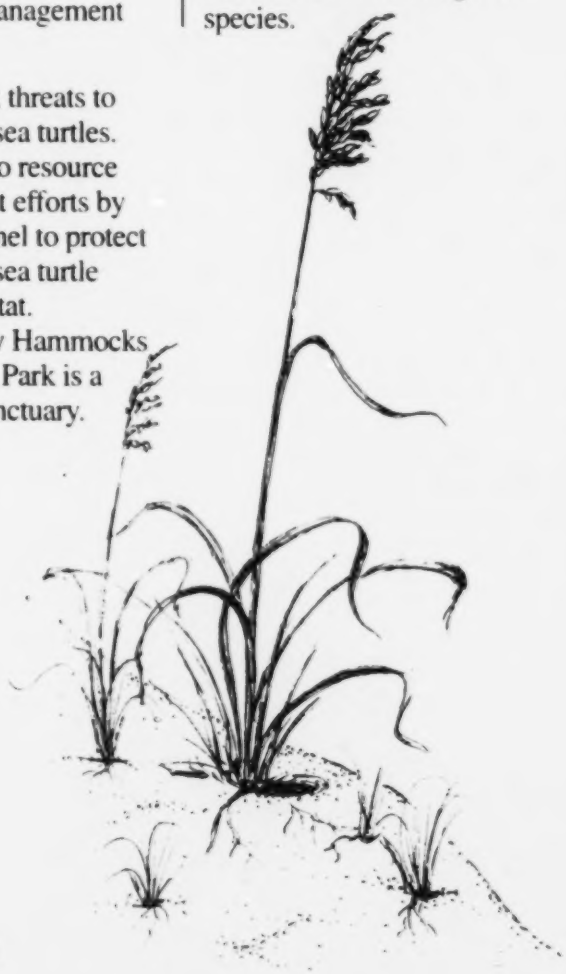
Major Concepts:
- Habitat
- Resource management

Objectives:
- Describe six threats to loggerhead sea turtles.
- Describe two resource management efforts by park personnel to protect loggerhead sea turtle nesting habitat.
- Explain how Hammocks Beach State Park is a sea turtle sanctuary.

Educator's Information:

This activity is designed to introduce the students to the sea turtle's nesting habitat. To prepare for this, please read the Sea Turtle and Loggerhead Sea Turtle fact sheets in the Appendices.

Through a visit to Hammocks Beach State Park, the students will learn about the many hazards sea turtles face and how loss of habitat contributes to sea turtles becoming threatened and endangered species.



Student's Information

Sea turtle survival is directly affected by human activity and has been since the earliest coastal occupation by humans. Coastal Native Americans, as well as early European sailors, harvested sea turtles and their eggs for food. The Spanish at one time looked forward to the "**arribada**." This was the mass arrival of Kemp's (Atlantic) Ridley sea turtles to their **nesting** beaches. Because the turtles all arrived together, the adult females and their eggs were easy **prey**. More recently, sea turtles have been harvested and illegally poached to produce products such as jewelry, trinkets, ornamental items and leather goods. In many countries of the world it is still legal to harvest sea turtle meat and eggs as a food source.

Many activities and conditions near the open beach area can reduce the chances of a sea turtle nesting, a **clutch** developing or a **hatchling** reaching the ocean. Coastal development, vehicle and human traffic, lighting, pollution, poaching, turtle products and commercial fishing each have a negative impact on sea turtle survival.

Coastal development has deteriorated nesting habitat and commercial fishing has caused many turtles to drown in nets. Discarded plastics and other debris generated by irresponsible humans have caused turtles to suffocate when these are ingested. Increased human activities can only lead the sea turtles closer to extinction unless humankind takes responsibility to reduce these hazards. Responsibility begins with education, research and **resource management**.

Instructions:

1. Prior to visiting the park, have the students read the Student's Information and the Loggerhead Sea Turtle Fact Sheet (Appendix 2).

2. Divide the class into groups of four students. Discuss the location of the nest sites turtles might choose.

3. Have the students walk from the surf zone to the dune line while discussing how a several hundred pound reptile, adapted for swimming, has to lumber from the ocean to find a suitable **nesting** location. If possible, have the students pretend to be a turtle and crawl up the beach like a turtle in search of a nest site. Have each group find what they think would be a suitable nesting location and mark it.

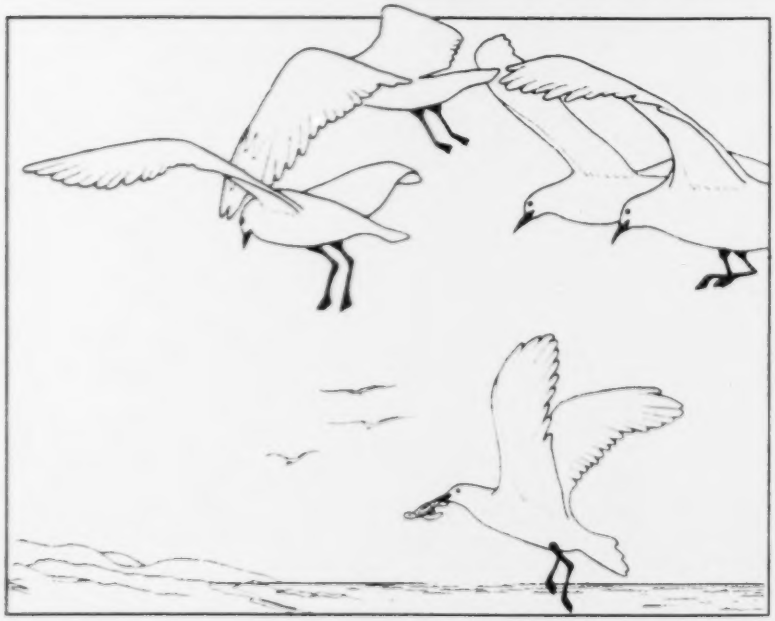
4. After the student groups have marked their "nests," reassemble the class. Have each group present their nest site and describe why they selected that particular site. Discuss the locations where loggerhead sea turtles typically nest.

Be sure to mention that turtles often return to the same beach or coastal area year after year. (Remember, the females will not come back yearly because they do not nest every year. However, the males might come back yearly; scientists do not know for sure since the males never come up on the beach and are, therefore, very hard to monitor.) These turtles might have been imprinted to that beach as a **hatchling**, or they might focus on geologic features such as shoals, rocks or currents.

Sea turtles tend to nest between the mean high tide and the top of the primary dune. The location is also affected by the consistency of the sand, amount of vegetation and disturbance to the beach area, by such things as vehicles, people, lights and buildings. Given all these considerations, have the students re-evaluate their group's nesting site and place the wire mesh over their final nest location.

5. Hand out the "Sea Turtle Threats" worksheet. After the students complete their worksheets, re-gather the group and lead a discussion on the possible threats listed on the worksheet. Discuss the solutions the students created to deal with the problems.

6. Discuss what **resource management** is. Tell the class only trained resource managers with a valid permit from the North Carolina Wildlife Resources Commission can work with turtle nests and turtles. Why do you suppose that's so? (Because these are **threatened** and **endangered species**. The researchers must be trained to ensure they properly manage the turtles for maximum survival.) Be sure to mention that one of the most important resource management efforts that can be done for sea turtles is to create **sanctuaries** of beach and water areas. These sanctuaries, such as Hammocks Beach State Park, provide protected **habitat** for the sea turtles.



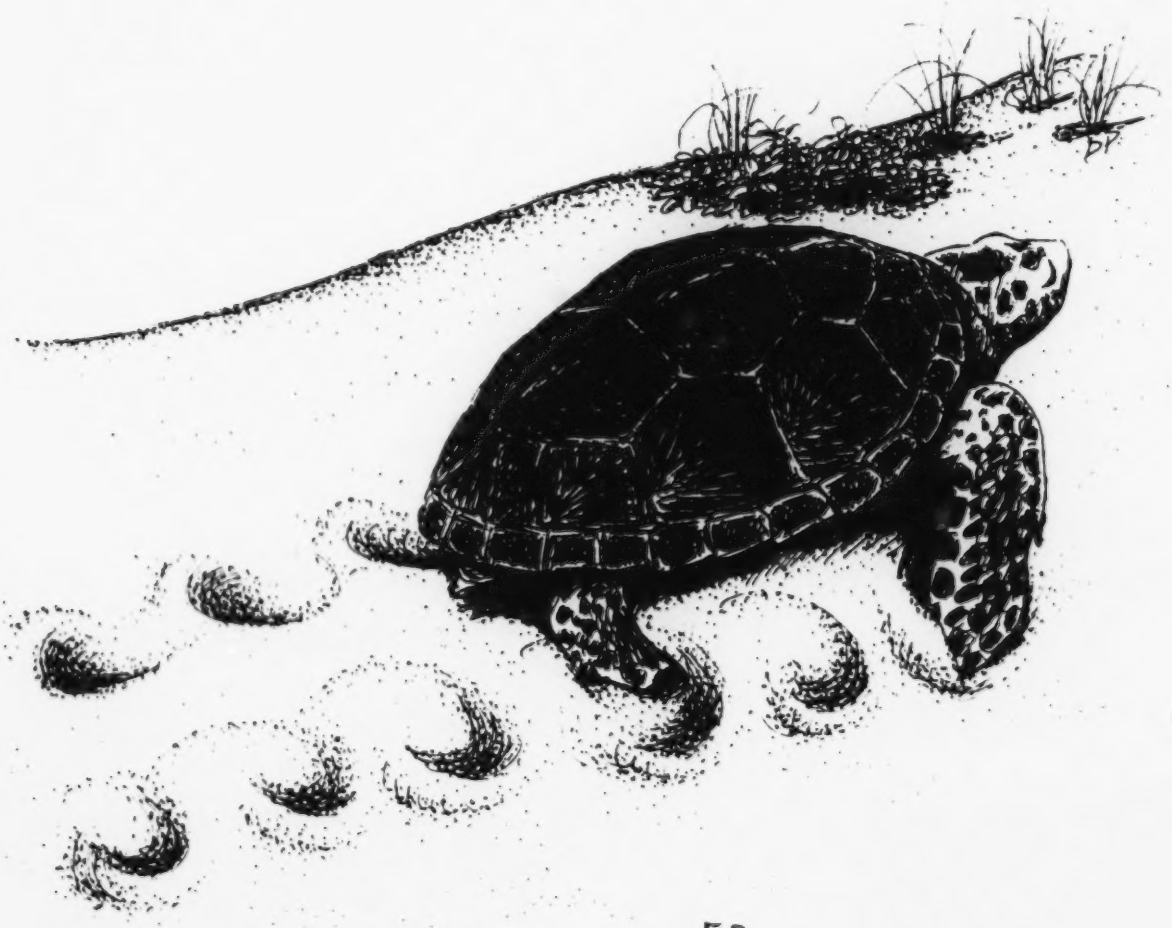
7. Finally, lead a discussion on the resource management tools used to protect sea turtles. Discuss the use of a red flashlight to find turtles on the beach. (Sea turtles do not easily see the wavelength transmitted by a red light.) Describe how to tag/measure a turtle so you can hope to monitor it from nesting season to nesting season. Do you suppose many male turtles are ever tagged? (No, since male turtles do not come up on the beaches.) Discuss how the information is used to learn more about a sea turtle's natural history. Show the class how the wire mesh is used to cover the nest and explain why predators cannot dig through the wire. In extreme cases, it is necessary to relocate a nest. This would include a nest laid below the high tide line, areas threatened by storm tides, nearby vegetation's roots and erosion. The relocation must be done within the first 6-12 hours after laying to be effective. Did any group's nest need to be relocated?

Remember, by law only a trained person is permitted to perform these activities. Have the students return their papers so no litter is left on the beach.

Suggested Extensions:

1. Take the class on a visit to one of the three North Carolina Aquariums to view living sea turtles. (Note: You should call in advance to have the admission fee waived.)

2. Ask for a student to volunteer to take photographs during the on-site visit. As a post-visit activity, assign students to create a bulletin board display showing what they have learned.



Sea Turtle Threats Worksheet

Threats:	... Which affect sea turtles at Hammocks Beach	... Which affect sea turtles in the ocean	...Which would affect sea turtles if the beach were developed with houses and hotels	Natural threats	Human-made threats	Possible solutions
Street lights near the nest causing light pollution						
Development of beach front property						
Water pollution						
Predation by ghost crabs						
Predation by raccoons						
Trawling without TEDs						
Storms causing washovers through the dunes						
Vehicle traffic on the beach						
Poaching for illegal trade of turtle meat and shell for jewelry						
Nest damage by roots of the dunes plants						
Predation by sharks						
Others						

Will your solution create any problems or affect other animals? _____

_____

_____

Are your solutions realistic? Answer yes/no and why. _____

_____

_____

Sea Turtle Threats Answer Sheet

Threats:	... Which affect sea turtles at Hammocks Beach	... Which affect sea turtles in the ocean	...Which would affect sea turtles if the beach were developed with houses and hotels	Natural threats	Human-made threats	Possible solutions
Street lights near the nest causing light pollution			✔		✔	Turn lights off during hatching season; put shields on lights; use sensor lights
Development of beach front property			✔		✔	Stop development of actual beach front areas; set aside certain areas for no development
Water pollution	✔	✔	✔		✔	Stop dumping trash into ocean; stop ghost nets; stop erosion and pollution in the watershed
Predation by ghost crabs	✔			✔		Protect the nests w/ screens
Predation by raccoons	✔			✔		Protect the nests w/ screens
Trawling without TEDs	✔	✔			✔	Use TEDs; shorten the time nets can be in the water
Storms causing washovers through the dunes	✔			✔		Have a trained resource manager move nests to higher ground if they look like they might be threatened with washover
Vehicle traffic on the beach			✔		✔	Ban vehicles from the beach during nesting season
Poaching for illegal trade of turtle meat and shell for jewelry		✔			✔	Do more conservation education to teach why poaching is bad; increase penalties; increase patrolling
Nest damage by roots of the dunes plants	✔			✔		Have a trained resource manager move the nest to a more appropriate location
Predation by sharks	✔	✔		✔		
Others		ghost nets	pollution and trash on the beach			Educate people not to dump trash, nets, etc.

Will your solution create any problems or affect other animals? _____

_____

_____

Are your solutions realistic? Answer yes/no and why. _____

_____

_____

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April 1994 4.1.6 Hammocks Beach State Park, NC

On-Site Activity 2 — Talking Turtle

Major Concepts:
- Loggerhead sea turtle life cycle
- Adaptations
- Natural and human threats
- Resource management

Learning Skills:
- Communicating
- Listening for details and acquiring information

Subject Areas:
- Science
- English Language Arts
- See the **Activity Summary** for a Correlation with DPI objectives in these subject areas.

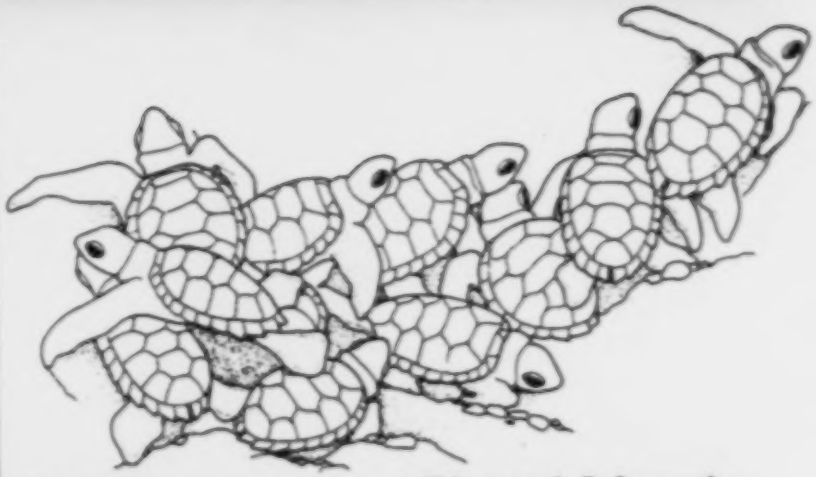
Location:
Nature Center or Bathhouse

Group Size: 30 students

Estimated Time:
30-45 minutes

Appropriate Season:
April 15 - October 15
(Island Trips)

Materials:
Provided by the park:
Slide show & equipment, models and taxidermy specimens, Jeopardy game board
Provided by the educator:
Per student: one copy of Appendices 1, 2 and 3

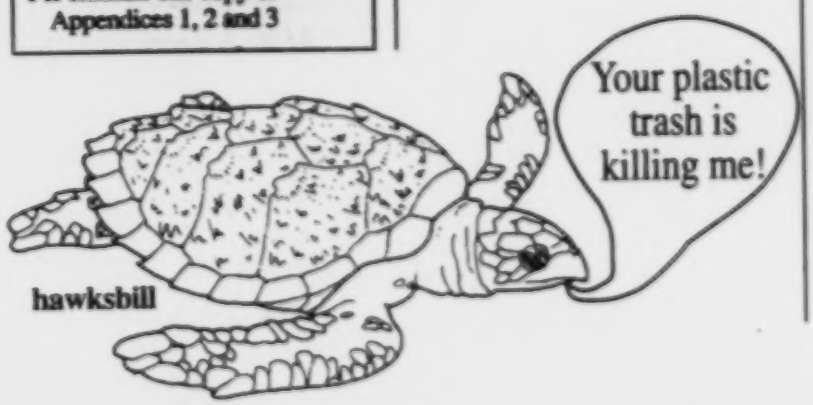


Objectives:
- Describe the nesting process of the loggerhead sea turtle.
- List five adaptations that help loggerheads to survive in marine environments.
- List five natural threats to loggerhead survival.
- List five human threats to loggerhead survival.
- Describe resource management efforts used to protect sea turtles.

Educator's Information:

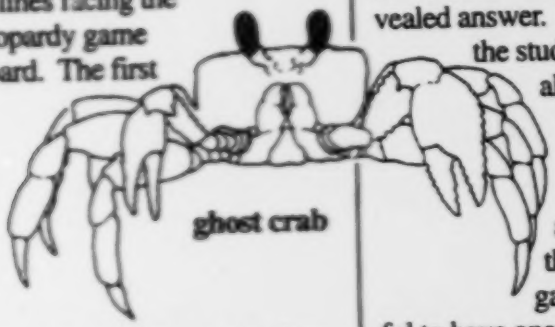
Prior to their visit to the park, students should read and discuss Appendices 1, 2, and 3. (This could be done in the context of one of the pre-visit activities in this EELE.) The educator should become familiar with the slide program text found in this lesson plan, and prepare the students for listening and viewing.

At the park, students will view a slide program describing the natural history of the loggerhead sea turtle. The program includes species identification, adaptations, life cycle and threats to the turtle's survival. The students will see and touch models and taxidermy items used to illustrate the slide program. After the program, the students will compete in a game of "Turtles in Jeopardy" which is patterned after the TV game show "Jeopardy."



Instructions:

After the slide program, divide the students into three teams. The teams will stand in lines facing the Jeopardy game board. The first person in each line is the first contestant. Select one of the three contestants to pick the first column and number amount to be revealed. (The amounts do not have to be selected in any particular order.) After the column and amount have been selected, uncover the answer and read it aloud.



ghost crab

The first of the three contestants to raise his/her hand gets a chance to correctly ask the question that would match the revealed answer. (Remind the students to always phrase their response in the form of a question just as they do in the real Jeopardy game.) It is helpful to have one leader read the board while another leader watches to see whose hand is raised first. If a student correctly responds to the answer, his/her team receives the point value on the cover card. The student with the correct response gets to select the next column and amount to be revealed. The three contestants from round one go to the back of their respective team's line. The winning contestant keeps the point card until the end of the game. The three new students, now at the front of the line, are the next contestants for their teams.

After all columns have been uncovered, each team adds their point value cards to determine which team has the most points. If there are any prizes or privileges to be awarded, that is done at this time. Two game boards are supplied in this activity so that two rounds can be played if desired.

100	100	100
200	200	200
300	300	300
400		

Slide Show Text

***NOTE: Instructions for the narrator are given in capital letters.**

1) Welcome to Hammocks Beach State Park. The park consists of 33 acres on the mainland and the adjacent Bear Island which is a barrier island nearly 900 acres in size.

2) Bear Island is about three-and-one half miles in length and about one-half mile wide, and is oriented east-to-west. To the east of the island is Bogue Inlet which lies between Emerald Isle and Bear Island. To the west is Bear Inlet and Brown's Island which is used by the military. As you may have noticed, Bear Island is undeveloped, which makes it an ideal **nesting beach** for sea turtles.

3) There are seven species of sea turtles, five of which may be seen off the coast of North Carolina. The largest one is the **leatherback**. This turtle may reach six feet in length and weigh about 1,300 pounds . Although this turtle can be seen in offshore waters, it primarily nests in the **tropics**. The loggerhead sea turtle, seen here chasing a horseshoe crab, is the most common nesting turtle at Bear Island.

USE TOY MODEL WITH SLIDE #4

4) The loggerhead sea turtle has a reddish-brown **carapace**, or shell. Fishermen who used to see the turtle bobbing in the water said its head resembled a log and gave it the name, loggerhead. Sea turtles are different from land turtles, because they live in the ocean. *ASK AUDIENCE WHAT THEY THINK THE DIFFERENCES ARE* All sea turtles have **flippers**, which they use to swim. The loggerhead averages about *SHOW LENGTH WITH ARMS SPREAD ABOUT THREE FEET WIDE* three feet in length and weighs between 200 and 400 pounds.

SHOW TURTLE SKULL WITH SLIDE #5

5) ASK THE GROUP IF LOGGERHEADS HAVE GILLS OR LUNGS. Sea turtles have lungs just like you and I. Loggerheads can remain underwater for several hours. (Up to five hours under laboratory conditions). During long periods underwater, their metabolic rate slows and their heart beats once every nine minutes. They also have a large head with strong jaws, which they can use to break open—

6) Crab and whelk shells * SHOW WHELK SHELL AND TURTLE SKULL*

7) They also eat **jellyfish**, shrimp and seaweed.

*SHOW BARNACLE AND BONE FROM CARAPACE WITH SLIDE #8

8) This crustacean is known as a **barnacle**. This particular barnacle only exists on sea turtles, and especially on the loggerhead. It is not known if this invertebrate is parasitic.

9) Scientists can use barnacles to identify sea turtles during the nesting season, because each turtle has its own unique pattern of barnacles on its carapace, just as each human has a unique set of fingerprints. Scientists can take pictures of the loggerhead's barnacle pattern and save them to compare with females that come ashore later. This will help determine if the same females are coming back to Bear Island to nest. This procedure is called **photo tagging.**

10) As the sun slowly sets, it marks the beginning of a researcher's day. In the United States female loggerheads nest along the southeastern coast between North Carolina and Florida. Nesting season here begins in late May and will last until about the middle of August.

11) Females slowly make their way out of the water and onto the beach anytime between sunset and sunrise. They generally nest above the high tide line, near the dune base.

12) Once she has found a suitable place, she uses her body to hollow out a body pit. She then uses her hind flippers to dig out the nest chamber.

SHOW MODEL NEST WITH SLIDE #13

13) Once she has dug out a pear-shaped chamber, she will deposit between 100 and 180 eggs, with the average being 120. Turtle eggs are different than chicken eggs, because turtle eggs have a leathery shell. They must be soft so they will not break when the female drops them into the nest.

SHOW MODEL TURTLE, TAGGING EQUIPMENT AND HOW/WHERE THE TAG WOULD BE PLACED WITH SLIDE #14

14) While laying the eggs, the female goes into a nesting trance, and she is not fully aware of her surroundings. At this time the researcher can approach the turtle to measure and tag her. Tagging is done to obtain more information on these elusive **reptiles**. The researcher uses a red light because sea turtles cannot see the color red. Photo tagging may also be done at this time.

15) While the female is nesting, tears can been seen falling from her eyes. Some people think she is crying because she is leaving her babies behind, but she is actually ridding herself of excess salt.

16) When she has finished laying her eggs, she will use her hind flippers to pull sand over the nest, and then use her body to pack it down.

17) She will throw sand over the entire site with her front flippers to disguise the area.

18) The turtle then returns to the sea, but never to that nest. She may, however, return to Bear Island in 10-14 days to make another nest. A turtle will make about four nests a season, every other year.

19) Walking along the beach on a summer morning, you may see something like this: two bulldozer-like tracts and a large disturbed area. This is a good example of a nest site.

20) Occasionally you may see something like these turtle tracks that do not lead to a nest. This is known as a false **crawl**. Sometimes a turtle will come ashore and crawl around only to decide she does not like the feel of the sand, or perhaps there are too many shells or roots in the sand. She goes back to the ocean but may return that night, or the following night, to try again.

21) This is an example of a nest that was destroyed by the cute but destructive....

22) Raccoon. Raccoons will dig up sea turtle nests and eat the eggs. They will also eat **hatchling** turtles. Man has unwittingly helped increase raccoon numbers by providing them with a year-round food supply, garbage.

23) Here at Hammocks Beach, the beach is patrolled most of the night by researchers looking for nesting turtles.

24) When a nest has been found, it is covered with a metal screen to protect it from predators. When the nest is due to hatch, the screen will be removed.

25) It takes about 60 days for a nest to hatch. Once the hatchlings break out of the eggs, they work as a group to get out of the nest. This will take 1-3 days. As they make their way out, the hatchlings pull sand down, and a depression forms. This indicates that the hatchling sea turtles will be leaving the nest soon.

26) Starting with the depression, hatchling emergence is an amazing sight! Once the hatchlings begin to poke their heads and flippers out of the sand, it is only a matter of waiting and watching.

27) More hatchlings appear at the surface, stimulating the others to crawl out. Hatchlings orient themselves towards the ocean because of its brightness. The top of the screen is the direction of the ocean. Notice that one turtle is facing the opposite direction. Bright lights cause hatchlings to become disoriented and crawl towards the bright lights. This is a big problem where people build houses, fishing piers and roads close to the beach.

28) On a dark beach it does not take long before they are headed in the right direction.

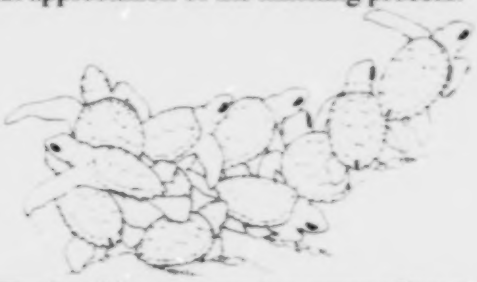
29) It almost appears as if the sand is boiling with turtles. These next few slides will give

you an appreciation of the hatching process.

30)

31)

32)



33) The hatching process is a group effort and generally occurs at night. This helps the hatchlings escape such predators as . . .

34) birds. At night, however, . . .

35) ghost crabs pose the biggest threat.

36) A ghost crab will drag a hatchling into its hole where it will eat it, and in the morning you see....

37) It took out the "trash," parts of the turtle it could not eat.

38) It is believed a hatchling, surviving on its left-over yolk, will swim for a few days to a calm area in the Atlantic Ocean known as the Sargasso Sea. Here it will float among the sargasso seaweed for the first year of its life.

39) Occasionally, a nest will have to be relocated, perhaps because it was laid too close to the water, or surrounded by a lot of roots. Relocation is only done in extreme circumstances. A sea turtle's sex is determined by the temperature of the sand. By relocating the nest, you may be altering the delicate process of development.

40) Sea turtles are protected under the Endangered Species Act. Beach development destroys nesting areas of the sea turtles. Without dark, undeveloped, clean beaches for the turtles to nest, their future generations will continue to be threatened.

41) Beach erosion is a natural problem that sea turtles face. When we renourish beaches to combat erosion, the sand which is placed on the beach may influence the female in her selection of nest site. This new sand may also alter the development of the hatchlings.

42) Dumping of wastes continues in the oceans. Plastic is one of the worst pollutants. Here is a hawksbill sea turtle that was entangled in fishing line. This one probably drowned when it could not surface for air.

Always remove fishing line found on the beach. Can you think of other common plastic items that could harm wildlife?

SHOW SKULL TO POINT OUT BRAINCASE IN SLIDE #43 ASK A STUDENT TO POINT TO THE LOCATION OF THE BRAINCASE IN THE TURTLE SKULL.

43) Here you can see the small size of the turtle's brain. The turtles rely on instinct. Sea turtles eat jellyfish. To them, a plastic bag floating in the water looks like a jellyfish and they eat the bag. Turtles can not digest or pass the plastic. The turtle will die of starvation because the plastic clogs its digestive system.

Whenever you see plastic pollution on or near the beach what should you do with it?

44) If you ever find a dead sea turtle on the beach, you should contact a park official, the local aquarium, or perhaps the police. Because sea turtles are endangered, deaths or injuries must be reported and dealt with accordingly. Can you think of any other agencies you could contact?

45) Through resource management efforts, and with your help and support, we can attempt to save these reptiles from extinction.

Turtles In Jeopardy

Talking Turtle	Turtle Trivia	Threats to Turtles
100	100	100
200	200	200
300	300	300
400	400	400

Turtles In Jeopardy		
Talking Turtle	Turtle Trivia	Threats to Turtles
The sea turtle species that nests on Bear Island	A clear, watery animal eaten by a sea turtle	This type of pollution can drown and entangle sea turtles
The number of species of sea turtles in the world	A small cone-shaped creature found on the carapace of most sea turtles	A crab that preys on hatchlings
Months of the year turtles nest on Bear Island	Largest sea turtle	This causes hatchlings to go in the wrong direction
The number of days it takes sea turtle eggs to hatch	Smallest sea turtle	Loss of nesting habitat is due to this

Turtles In Jeopardy – Correct Responses		
Talking Turtle	Turtle Trivia	Threats to Turtles
What is the loggerhead?	What is a jellyfish?	What is discarded fishing line or plastic pollution?
What is seven?	What is a barnacle?	What is a ghost crab?
What is May through August?	What is the leatherback?	What is bright light?
What is 60 to 90 days?	What is the Kemp's Ridley?	What is coastal development?

Turtles In Jeopardy		
Talking Turtle	Turtle Trivia	Threats to Turtles
100	100	100
200	200	200
300	300	300
400	400	400

Turtles In Jeopardy		
Talking Turtle	Turtle Trivia	Threats to Turtles
A sea turtle breathes with these	Crying helps a sea turtle do this	Name for severe storms that sometimes hit the coast
An adaptation that allows loggerheads to eat hard-shelled animals	Method used to record a turtle's barnacle pattern	A masked mammal that eats turtle eggs
Average size or weight of a loggerhead sea turtle	Under lab conditions, five hours	Turtles often mistake these for jellyfish
This determines the sex of a developing sea turtle	The name for turtle tracks that do not lead to a nest	Natural loss of beach

Turtles In Jeopardy – Correct Responses

Talking Turtle	Turtle Trivia	Threats to Turtles
What are lungs?	What is rid its body of excess salt?	What is a hurricane?
What is a large head, sharp beak or strong jaws?	What is photo tagging?	What is a raccoon?
What is three feet in length or 200 to 400 pounds?	What is how long a sea turtle can hold its breath?	What are plastic bags?
What is the temperature of the sand?	What is a false crawl?	What is beach erosion?

On-Site Activity 3 — Crawl For Life

Major Concepts:
- Adaptations
- Predator/prey relationships
- Endangered wildlife
- Human impact on wildlife

Learning Skills:
- Communicating, inferring, predicting, interpreting data
- Graphing, using probabilities
- Responding creatively to personal experiences

Subject Areas:
- Science
- Mathematics
- English Language Arts
- * See the **Activity Summary** for a Correlation with DPI objectives in these subject areas.

Location:
Open beach on Bear Island; alternative sites include grassy playing field or large indoor play space

Group Size: 30 or more

Estimate Time: 45-60 minutes

Appropriate Season:
April 15 to October 15

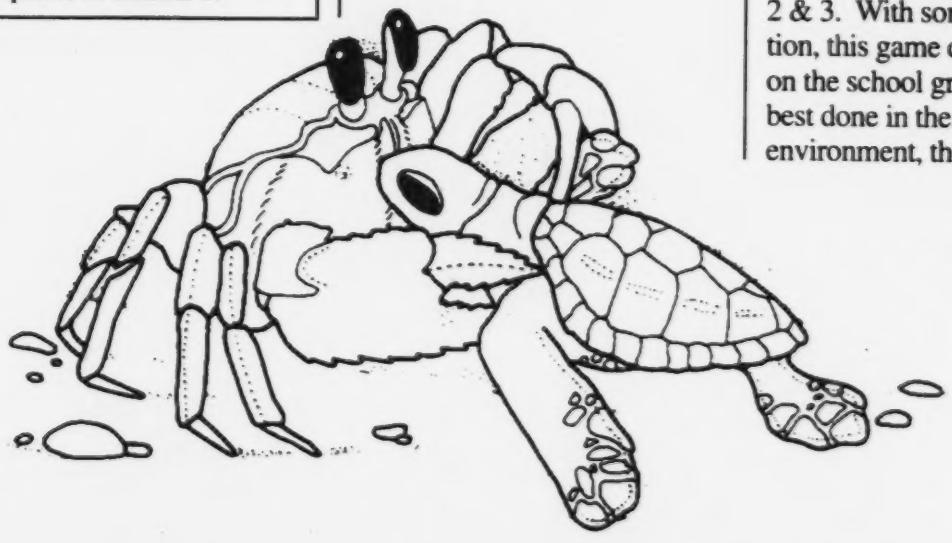
Materials:
Provided by the park: boundary markers for the playing field; pictures of ghost crabs, raccoons and/or other beach predators; piece of poster paper and magic marker; stopwatch or watch with a second hand; whistle
Provided by the teacher:
Per student: Appendices 2 & 3, graph paper (optional)

Special Considerations:
Students should be dressed in clothing appropriate for a physical education class.

Objectives:
- List three natural predators of loggerhead sea turtles.
- Describe the nesting cycle of loggerhead sea turtles.
- Explain the low survival rate of hatchlings and how sea turtles compensate for young lost to predators.
- Describe how humans impact sea turtle reproduction.

Educator's Information:

In this physically active simulation, students will role-play **hatchling** sea turtles as they crawl from their nest site to the ocean. A few students will role-play the **predators** that commonly prey upon hatchlings. The teacher should prepare the students for the field trip by encouraging them to wear proper clothing and by discussing the threats to sea turtle hatchlings in Appendices 2 & 3. With some modification, this game can be played on the school grounds, but is best done in the turtle's natural environment, the **beach**.



Instructions:

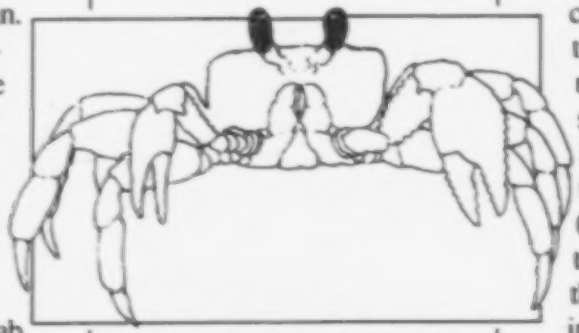
1. It is recommended that students read Appendices 2 & 3 or complete one of the previsit activities in this EELE before participating in this simulation.

2. The educator or park ranger should mark off a playing field approximately 100 feet by 100 feet on the beach. One end of the field should be just above the high tide mark and the other near the base of the dunes. The corners of the field should be clearly marked with stakes, shoes or backpacks. The educator should check the area carefully for hazardous objects before starting the game.

3. For a group of 30 students, select four to play the predators. If the group is larger than 30, increase the number of predators proportionately. The remaining students will role-play hatchling sea turtles.

4. Introduce the game to the students by showing them pictures of ghost crabs, raccoons and other beach predators. Briefly review how turtles hatch from a nest and crawl for their lives to the ocean. Then describe the pantomime for each role in the game. Two of the predators will be ghost crabs. They must bend their knees and hold their arms up at shoulder height to mimic the motion of a real ghost crab. They may only move sideways. (Educator/ranger should demonstrate the motion.) The other two predators should role-play raccoons. They must walk on all fours by placing the palms of their hands down on the sand. They can use their feet in the normal way; they should not crawl on their knees. (Again, the educator/ranger should demonstrate the motion.) The other students will role-play the hatchling loggerhead sea turtles. They should kneel on the sand and place their hands on their shoulders. Then, they should bend over with elbows touching the sand. (Their folded arms and elbows represent the front flippers of a sea turtle.) To crawl, they should move limbs <u>alternately</u>; i.e., left elbow with right knee and right elbow with left knee. This alternating motion represents how loggerheads crawl; other turtle species move <u>opposite</u> limbs together. (Educator/ranger should demonstrate the crawl for life.) Students should practice their pantomimes before starting the game.

5. The goal of each hatchling is to crawl across the playing field from the dune side to the high tide side without getting tagged by a predator. Each predator will try to tag as many hatchlings as possible. Both predators and hatchlings must stay within the bounds of the playing field. Turtles are safe when they reach the high tide end of the field. Once the turtles reach the "safe" side, they should stay there until the end of the game. If a turtle is tagged, it is "dead" and must stay where it was tagged until the end of the game.



6. To start, ask the turtles to arrange themselves on the dune side of the field. Predators will start on the opposite side. When the educator blows a whistle, the game will start. A second whistle blast signals that the game is over and all students should freeze in their places. The educator should time the game with a stopwatch or watch with a second hand.

7. When all the hatchlings have been tagged or have made it to the "safe" side (ocean), the educator should blow the whistle a second time. Record the game time on the poster paper with the magic marker. Make a quick count of the number of turtles that "died" and the number that made it safely to the "ocean." Record these results on the poster paper, also. (The educator may want to take the poster back to the classroom for graphing activities later.) The educator should gather the class together as a group and

display the results. Tell the class that they will be playing the game again with four new students representing the predators. Ask one or two of the predators to role-play humans who are poaching sea turtle eggs and hatchlings. The student(s) playing humans can run on two legs, of course. The remaining predators will be ghost crabs and raccoons and must do these pantomimes. Allow the students to "huddle" with other students playing their same roles to discuss strategy before starting the game.

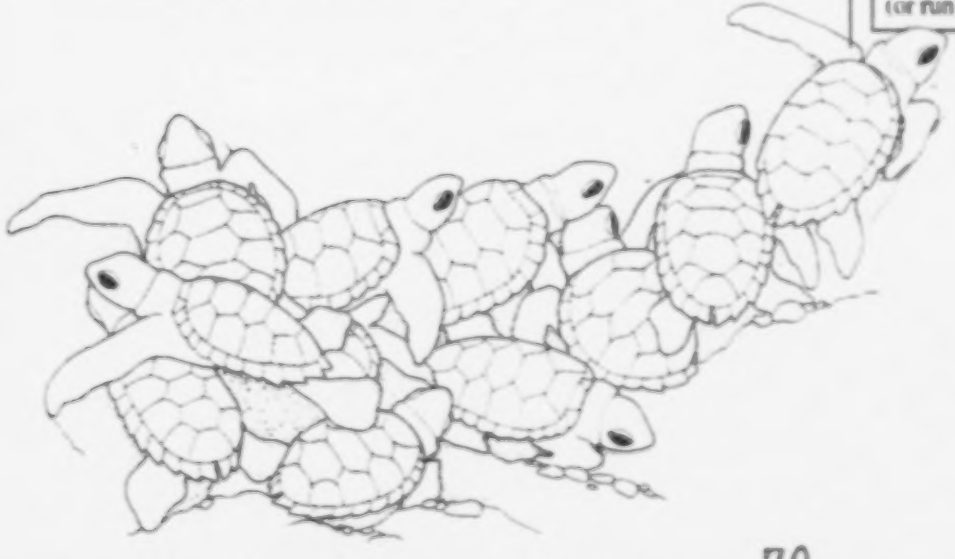
8. Play the game again and record the results. Gather the students together for a discussion. Ask the students why they think the survival rate for hatchling sea turtles is so low. How do sea turtles attempt to compensate for this problem? (Loggerheads nest several times a season and lay about 120 eggs each time. In 1992, forty-two turtle nests were recorded on Bear Island. That's about 5,000 eggs! Sea turtles lay large numbers of eggs and nest several times to insure that a few young will survive.) Ask the students to think of other animals that use the same strategy. Compare the results of the two games. How do human predators compare with other animal predators? What other impacts do humans have on sea turtle reproduction? (Pets such as dogs and cats kill hatchlings; streetlights confuse hatchlings; vehicle tracks on beach trap hatchlings; beach development and renourishment projects destroy nest sites; people increase raccoon and gull populations due to an increase of garbage along the coast.) Conclude with a discussion of why we should be concerned about sea turtles and what we can do to help them.

Extension:

Play the game several times, doubling the number of predators each time. (Game 1 would have one predator; game 2, two; game 3, four; game 4, eight.) Keep constant the number of sea turtle hatchlings playing each game. Also keep the playing time constant for each game. Before beginning this series of games, ask the students to write a hypothesis that describes what will happen to the number of surviving sea turtles as the number of predators is doubled. Record the number of turtles surviving at the end of each game. Graph the number of survivors (dependent variable on the "y"-axis) versus the number of predators (independent variable on the "x"-axis). Ask the students to accept or reject their initial hypotheses based on the actual results of their "experiment."

Note:

If you are playing the game on a grassy field, you will not want students to crawl on their hands and knees as they could do on the beach. Alter the pantomimes somewhat to accommodate a different playing surface. For example, turtles must hop on one foot; predators can walk (or run) normally.



Post-Visit Activity #1 — Sea Turtle Trek

Curriculum Objectives:

Grade 6
- Communication Skills: listening, reading, vocabulary and viewing comprehension, study skills using environmental sources
- Guidance: competency and skill for interacting with others
- Healthful Living: environmental health, how people affect the environment
- Science: ecology

Grade 7
- Communication Skills: listening, reading, vocabulary and viewing comprehension, study skills using environmental sources
- Guidance: being responsible in a group
- Science: characteristics of animals, organization and variety of living things, animal communities, interaction of people and the environment
- Social Studies: know the importance of natural resources

Grade 8
- Communication Skills: listening, reading, vocabulary and viewing comprehension, study skills using environmental sources
- Science: adaptation, ecology

Location: Classroom

Group Size: Class size

Estimated Time: 40 minutes

Appropriate Season: Any

Materials:
Provided by the educator:
Part I:
Per student: Student's Information, 1 game token (can be anything small, such as a small shell)
Per group: One game board (assemble by taping, gluing or laminating the game to cardboard), 1 set of "Turtle Tip" cards, 1 die
Part II:
Per student: "A Maze of Threats," pencil

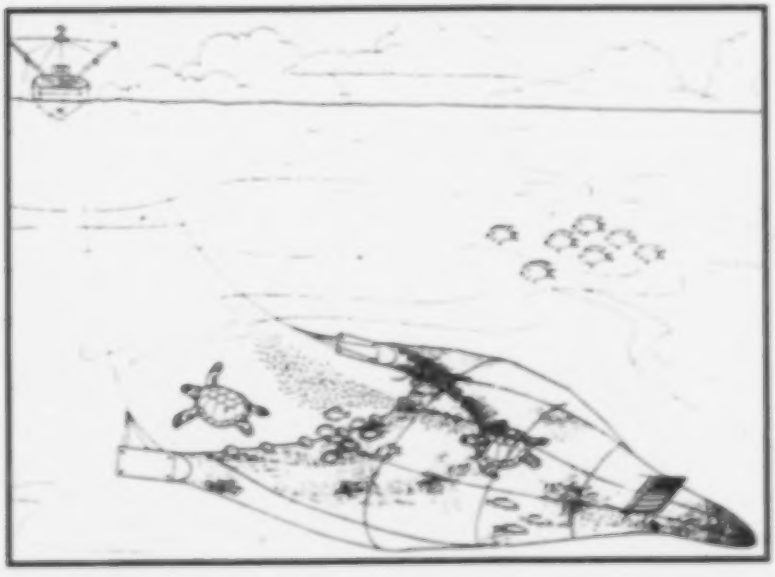
Major Concepts:
- Life cycle
- Natural threats to sea turtle survival
- Human threats to sea turtle survival

Objectives:
- Describe the life cycle of the loggerhead sea turtle.
- Explain the low rate of hatchling survival.
- List three natural threats to sea turtle survival.
- List three human-created threats to sea turtle survival.

Educator's Information:

This activity focuses on the natural and human threats sea turtles encounter during their life cycles. Before beginning the activity, please read Appendix 3, Sea Turtle Conservation.

In Part I, the students will read about sea turtles, then play the game of sea turtle survival, "Sea Turtle Trek." In Part II, the students will complete a maze, helping the hatchlings make it to adulthood.



Sea Turtle Trek

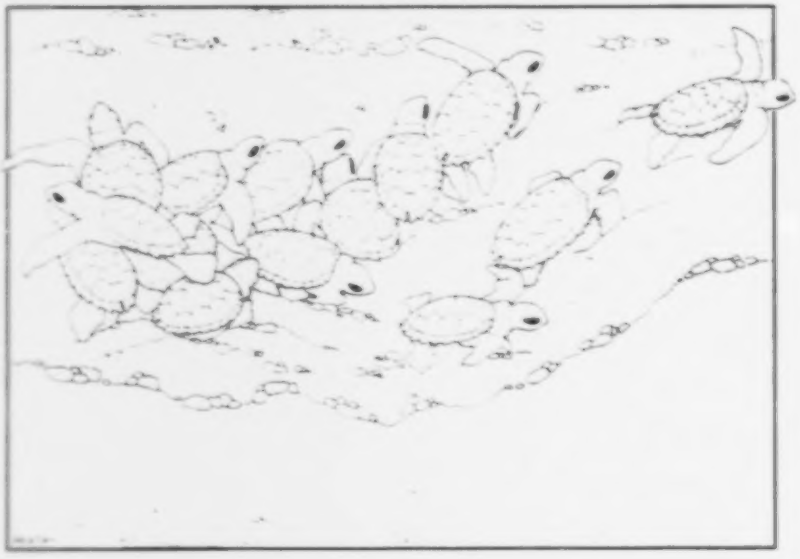
Sea turtles are **reptiles** that spend almost their entire life cycles in the seas and oceans of the world. There are seven species worldwide. Of the seven, five of them, the leatherback, loggerhead, green, Kemp's Ridley (or Atlantic Ridley) and hawksbill, can be found in the Atlantic Ocean. The most common **nesting** turtle in North Carolina is the loggerhead, which grows to a weight of between 200 and 350 pounds when mature. The largest sea turtle, however, is the leatherback, which can weigh as much as 1300 pounds.

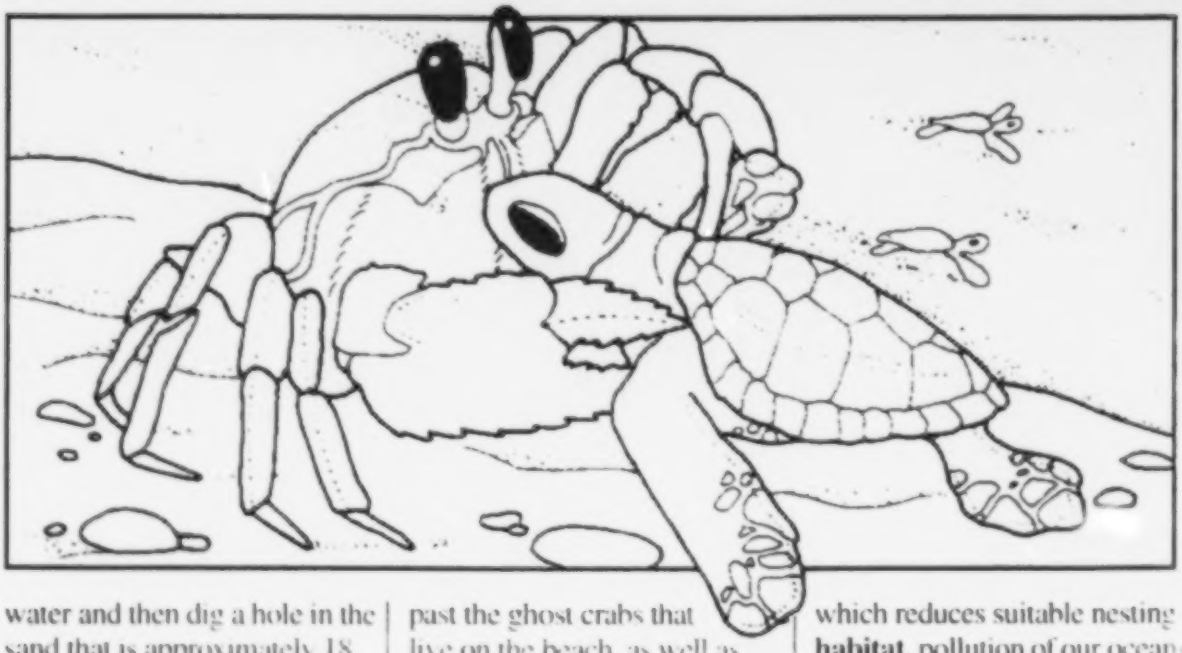
Sea turtles have special characteristics or **adaptations** that enable them to better survive in their ocean environment. For example, they consume the salty sea water that surrounds them and rid themselves of excess salt by tearing. Instead of having feet for crawling, like the smaller fresh-water turtles that we sometimes see on land, they have **flippers** for swimming. Sea turtles, like all reptiles, have lungs instead of gills like fish, so they cannot breathe underwater. However, they can stay underwater for several hours, by holding in the air that they breathe when they surface.

Unlike some other turtles, sea turtles can't pull inside of their shells for protection. Their head and flippers stay extended, making them more vulnerable to **predators** such as fish, sharks and killer whales. Fortunately, once they reach maturity, due to their large body size and thick, streamlined shells, they have very few natural enemies.

Sea turtles are **omnivorous**, which means that they eat both plants and animals. Some of the things they eat include **jellyfish**, crabs, sea weed and mollusks (sea shell animals). Sea turtles don't have teeth. Instead, they have a horny covering of the jaw called a **beak**. They have such powerful jaws that they can actually crush the shells of **crustaceans** in order to get at the meat inside the shell.

Loggerheads they nest on beaches in temperate and subtropical waters. In North Carolina they nest between the months of May and September. The females crawl ashore at night to lay their eggs. They usually crawl to the dune base, beyond the reach of high tide





water and then dig a hole in the sand that is approximately 18 inches deep. The female then deposits, on the average, 120 eggs. She then covers the hole with sand and crawls back to the ocean. She does not incubate the eggs.

After approximately 60 days, the eggs hatch and the **hatchlings** emerge from the sand. The temperature of the sand will determine whether the turtles turn out as males or females. Lower sand temperatures tend to produce more males, while higher temperatures tend to produce more females. Hatchlings orient themselves toward the brightest light which, hopefully, is the ocean reflecting the stars and moon. If there are artificial lights shining on the beach, some of the turtles might crawl in the wrong direction and never make it to the water. Once the hatchlings emerge from the nest, they have to get past the ghost crabs that live on the beach, as well as sea gulls and other birds that might try to prey upon them.

Herpetologists believe that sea turtles spend the first year or so of their lives at the surface of the water, floating in clumps of seaweed. The seaweed provides them with food and shelter. Because they are so small when first hatched, they are very vulnerable to predators in the early stages of life and many don't reach adulthood. In fact, many researchers believe that only 1 in 10,000 eggs laid will produce a turtle that reaches maturity.

Sea turtles have been in existence for over 150 million years, yet, in recent times their numbers have rapidly declined. This decline is a result of human activities that have affected, and continue to affect, turtle populations, such as development along the coast which reduces suitable nesting **habitat**, pollution of our oceans and the taking of turtles for food, jewelry and souvenirs. In addition, many sea turtles have been caught in fishing nets. Because the turtles are unable to come to the surface to breathe when they are in the net, they drown if not released quickly enough. A **Turtle Excluder Device (TED)** has been developed to be installed in fishermen's nets to help solve this problem. This device acts as a trap door to push the turtle out of the net after it gets caught. Hopefully, the more these devices are used, the more turtles will be saved. There are other efforts underway to protect sea turtles as well, including the passage of laws in the United States to help protect sea turtles.

As you play the following game, think about the many natural and human threats facing these unique reptiles.

Instructions:

Part I:

Have the students read the Student's Information. Separate the class into groups of five students and supply each group with a Sea Turtle Trek game set. Review Appendix 3, Sea Turltle Conservation and the instructions with the students. Allow the groups 15 minutes to play the game. After the game(s) ends, lead the class in a discussion on how difficult it was for a **hatchling** to survive. Is this true for real hatchling sea turtles? (Yes)

Rules for the Sea Turtle Trek game:

1. To decide who goes first, each player should roll the die once. The player who rolls the highest number starts the game. The person to his or her right plays next.

2. Each player should put his or her token on the space marked start.

3. The first player rolls the die and moves his or her token the number of spaces the die indicates. When a player lands on a space, they must follow the instructions that are written on the space.

4. If the space is a "Turtle Tip," then the player is asked a question from the "Turtle Tip" cards. The player to the left draws the top card from the stack. She or he reads it aloud for the player to answer. If correct, the player rolls again; if not, the player must wait until her or his next turn to again attempt to correctly answer the next "Turtle Tip" question. A correct answer must be given before that player can advance.

5. After the first player rolls once and moves, the rest of the players go, one at a time.

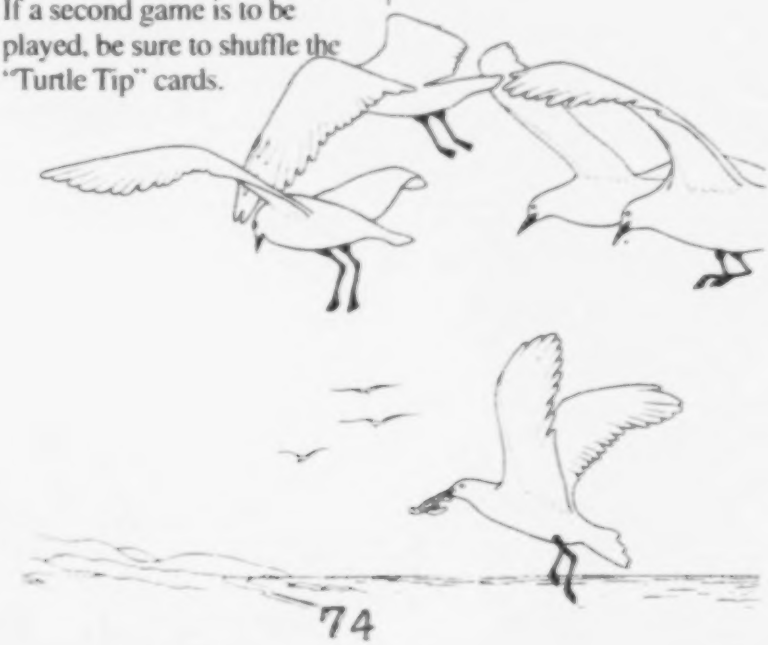
6. Play the game until one player reaches the end. To win, the player must accurately answer the final "Turtle Tip." If a second game is to be played, be sure to shuffle the "Turtle Tip" cards.

Instructions:

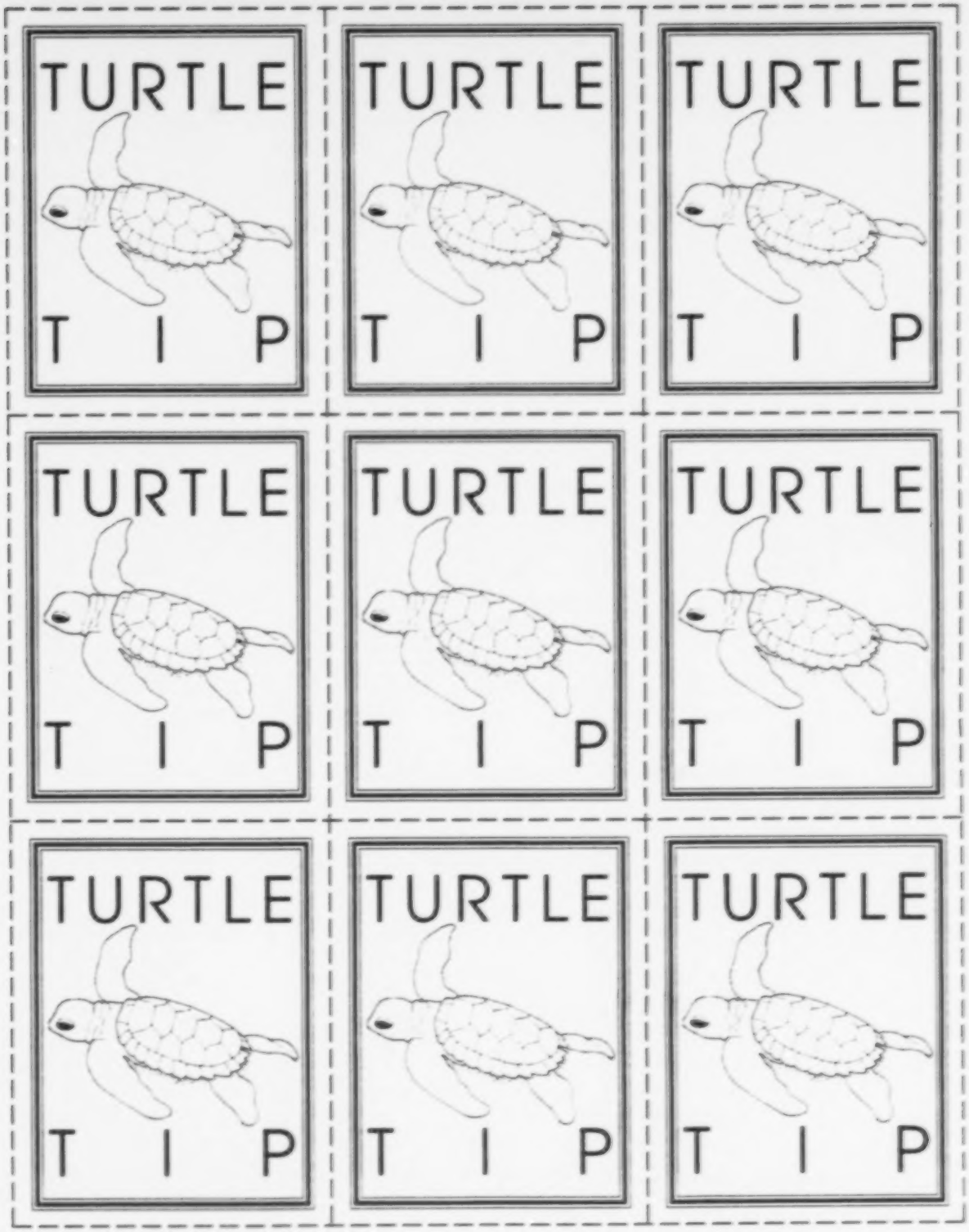
Part II:

Give each student a copy of "A Maze of Threats." Allow five to ten minutes for the students to complete the maze. When all the students are done, discuss with them how each of these threats affect real sea turtles. Then ask them to list any suggestions they have on how to reduce these threats. Ask them to try to think of specific things they could do which might help sea turtles.

(Note: If any of the students' suggestions are feasible for individual students or for your class as a whole to do, we encourage you to follow up on them and share what you are doing with the park staff.)



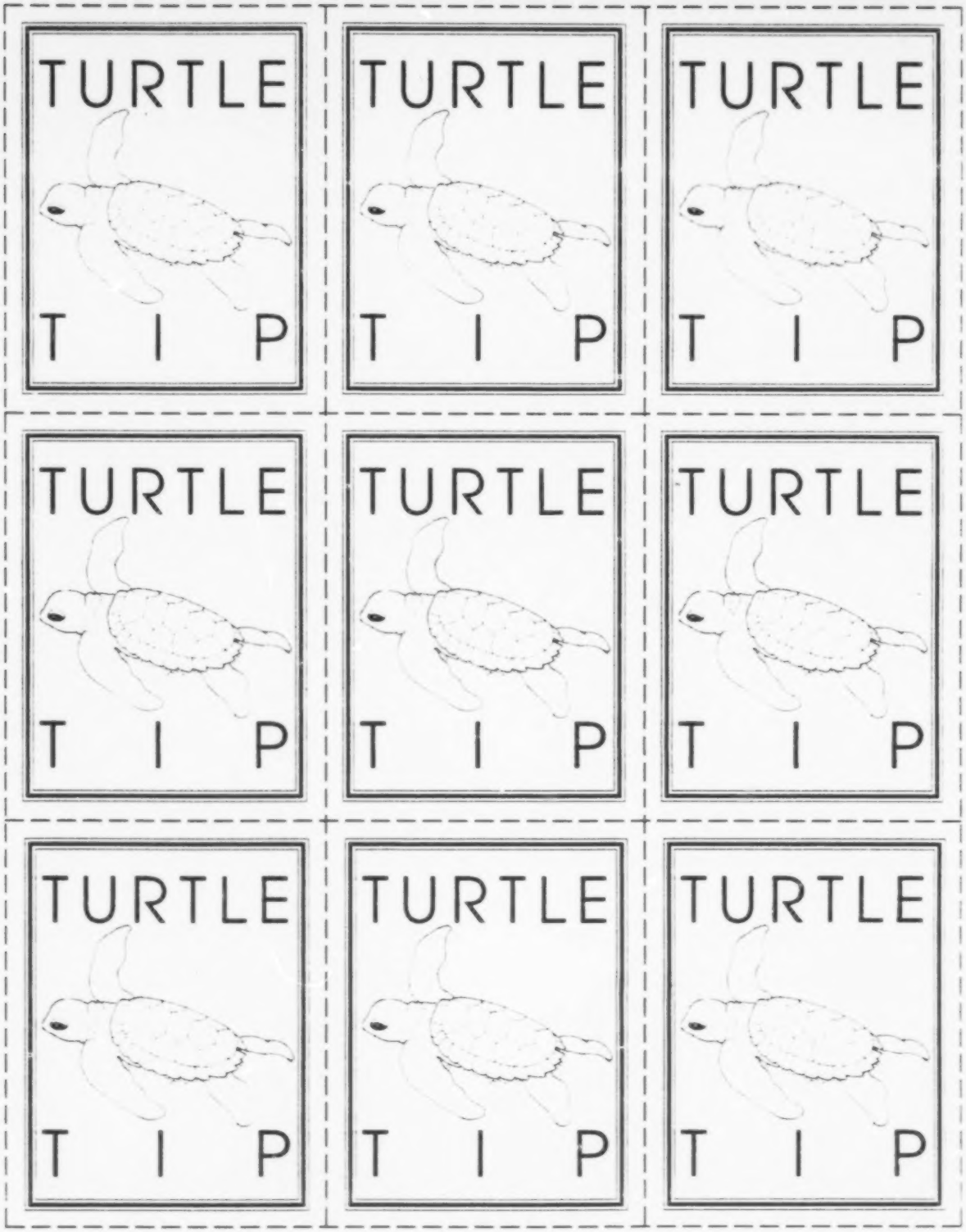
Turtle Tip Cards



Turtle Tip Cards

How many types of sea turtles are possibly found off the North Carolina coast, in the Atlantic Ocean? ANSWER: Five	What is the largest sea turtle in the Atlantic Ocean? ANSWER: Leatherback	Do sea turtles have gills or lungs? ANSWER: Lungs
What is the most common nesting sea turtle in North Carolina? ANSWER: Loggerhead	A sea turtle is a(n) — A. Insect B. Amphibian C. Reptile D. Mammal ANSWER: C	What do sea turtles drink? ANSWER: Sea water
Adult loggerhead sea turtles at maturity weigh about ? A. 50 - 75 lbs. B. 200 - 350 lbs. C. 1000 -2000 lbs. D. 1500 - 2000 lbs. ANSWER: B	True or False: Sea turtles can breath underwater. ANSWER: False	How do sea turtles rid themselves of excess salt in their bodies? ANSWER: By shedding tears

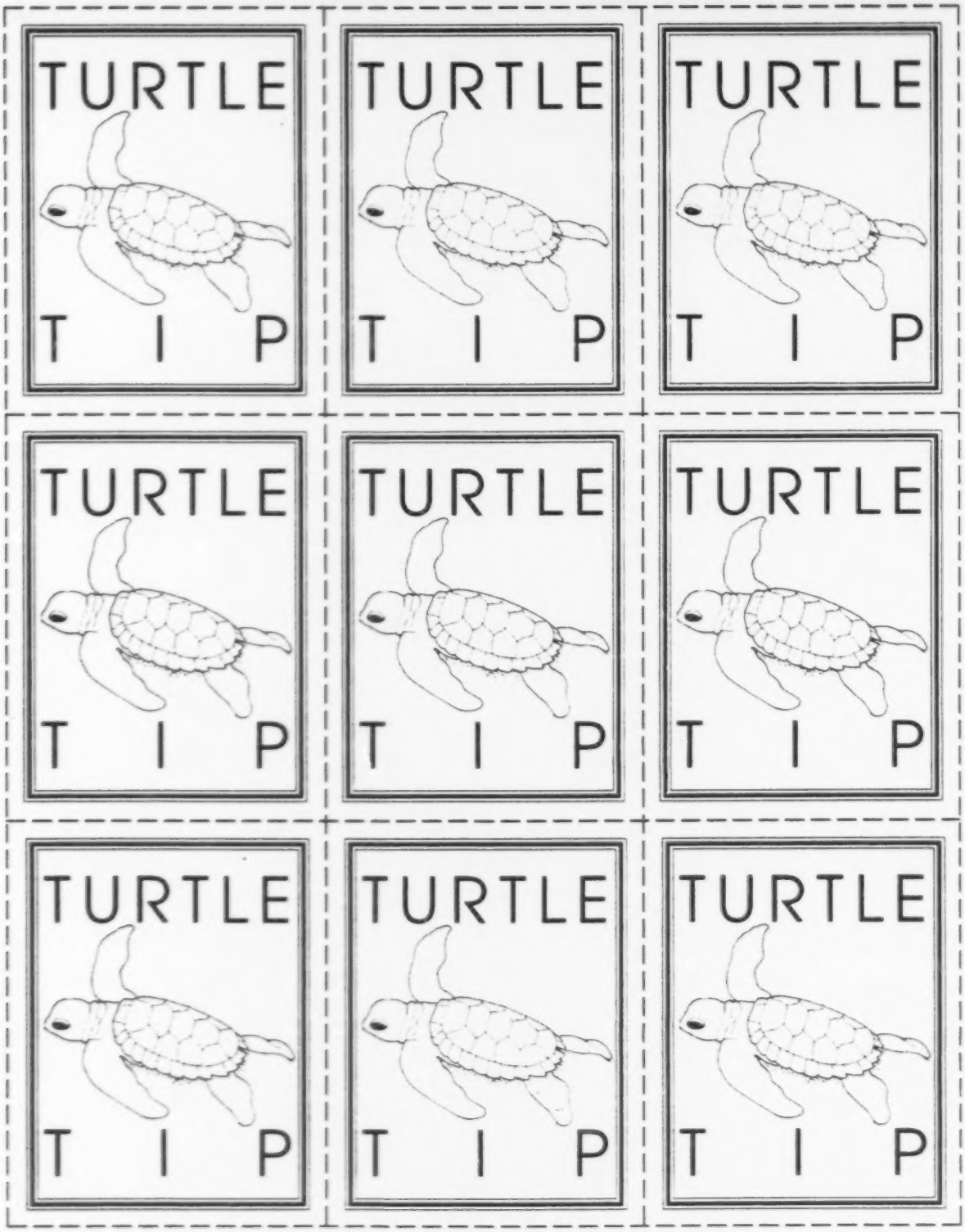
Turtle Tip Cards



Turtle Tip Cards

True or False: A sea turtle can pull its head into its shell for protection? ANSWER: False	Loggerhead sea turtles are: A. Herbivores (eat only plants) B. Carnivores (eat only animals) C. Omnivores (eat both plants and animals) ANSWER: C	True or False: Sea turtles nest in the winter in North Carolina? ANSWER: False
Where do sea turtles sleep? A. On the beach or sand dunes B. Under rocks on the ocean floor or floating at the waters surface C. In the forest behind the sand dunes D. In the "Turtle View" Condominiums ANSWER: B	Which of the following is NOT a food source for sea turtles? A. Jellyfish B. Acorns C. Seaweed D. Small crabs ANSWER: B	When do loggerhead sea turtles nest? A. At night B. During the day C. Only during the full moon D. Only after a storm ANSWER: A
Instead of teeth, sea turtles have? A. Gums B. Incisors and molars C. Canines D. A beak ANSWER: D	Which of the following is NOT a predator of sea turtles? A. Ghost crabs B. Humans C. Butterflies D. Sharks E. Sea gulls ANSWER: C	True or False: A female sea turtle will lay an average of 120 eggs per nest. ANSWER: True

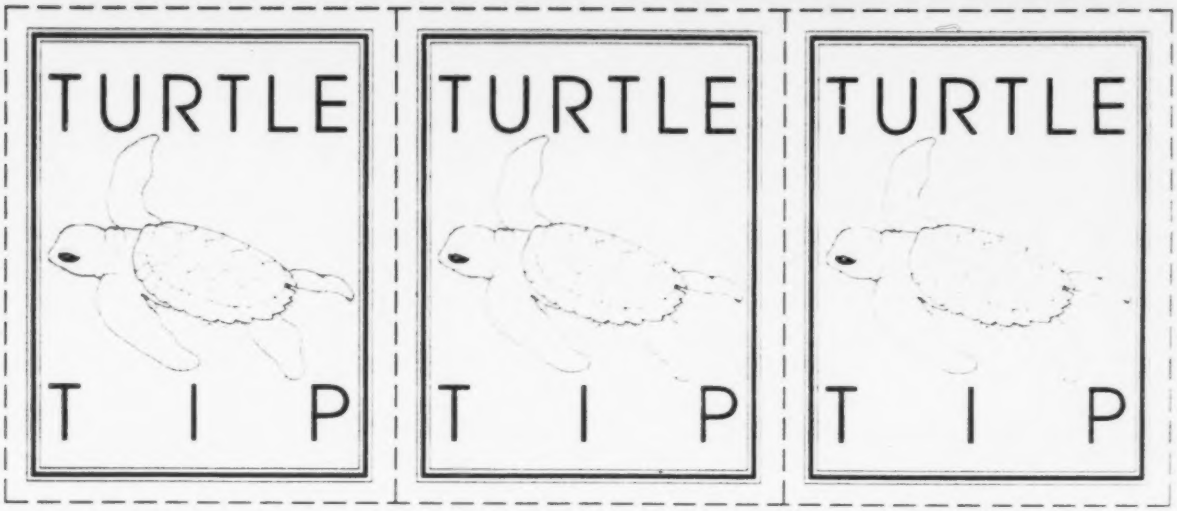
Turtle Tip Cards



Turtle Tip Cards

Sea turtles lay their eggs on: A. The ocean floor B. Sandy beaches C. Coral reefs D. Fishing piers ANSWER: B	**True or False: Female sea turtles incubate their eggs.** ANSWER: False	**Where is it thought hatchling sea turtles spend the first year of their life?** A. Floating in seaweed mats at the surface of the water B. Buried under the mud on the ocean floor C. In the sand dunes ANSWER: A
Sea turtle eggs usually hatch after approximately: A. 2 days B. 10 days C. 60 days D. 1 year ANSWER: C	**Could lights shining on the beach cause hatchling sea turtles to crawl in the wrong direction, away from the ocean?** ANSWER: Yes	**Approximately how many sea turtle hatchlings make it to adulthood?** A. Every one B. One in ten C. One in one hundred D. One in ten thousand ANSWER: D
What determines whether a sea turtle will hatch out as a male or a female? ANSWER: Temperature of sand	**Does moonlight reflecting on the ocean attract sea turtle hatchlings to the ocean?** ANSWER: Yes	**Does development along the coast reduce good nesting habitat?** ANSWER: Yes

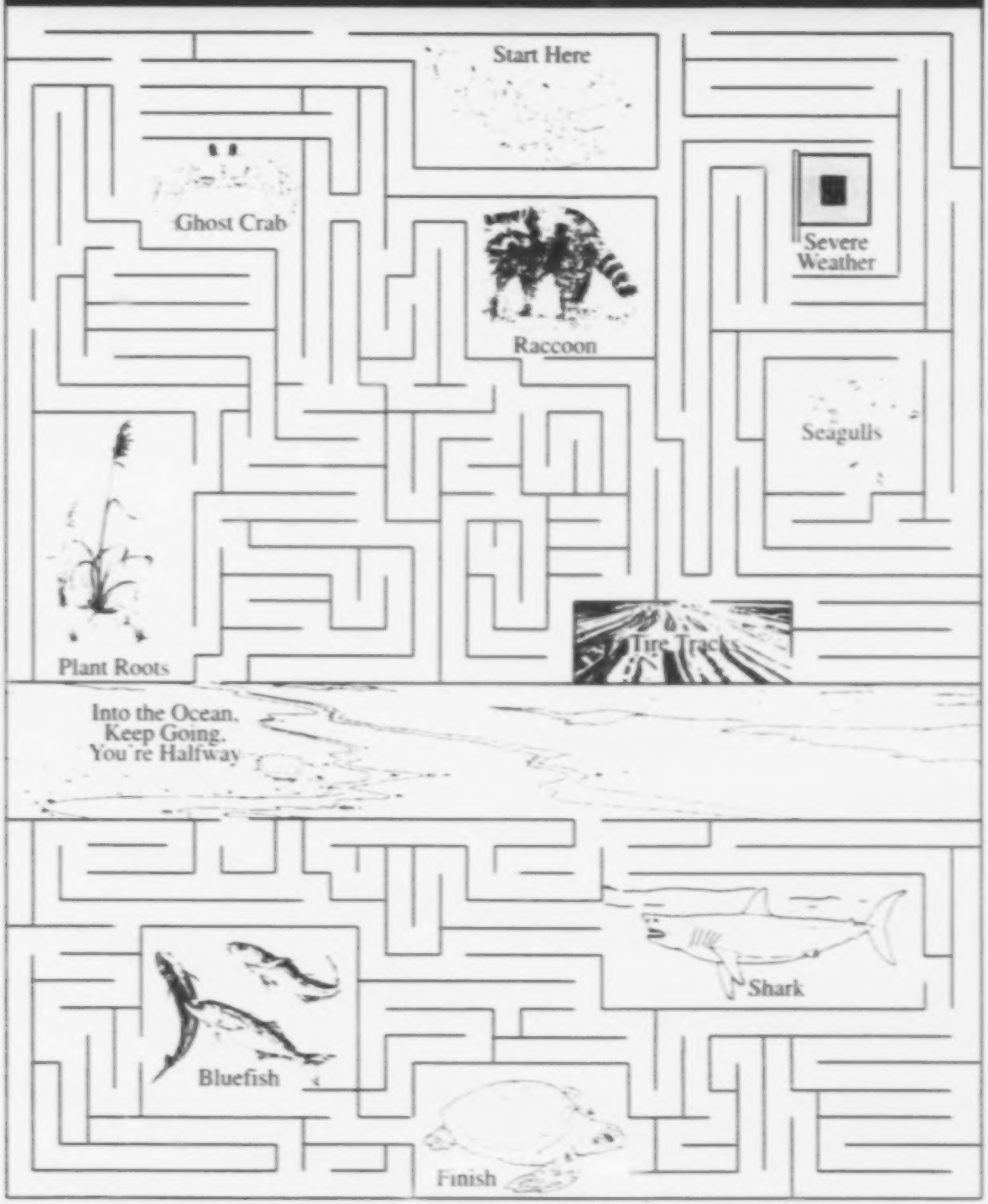
Turtle Tip Cards



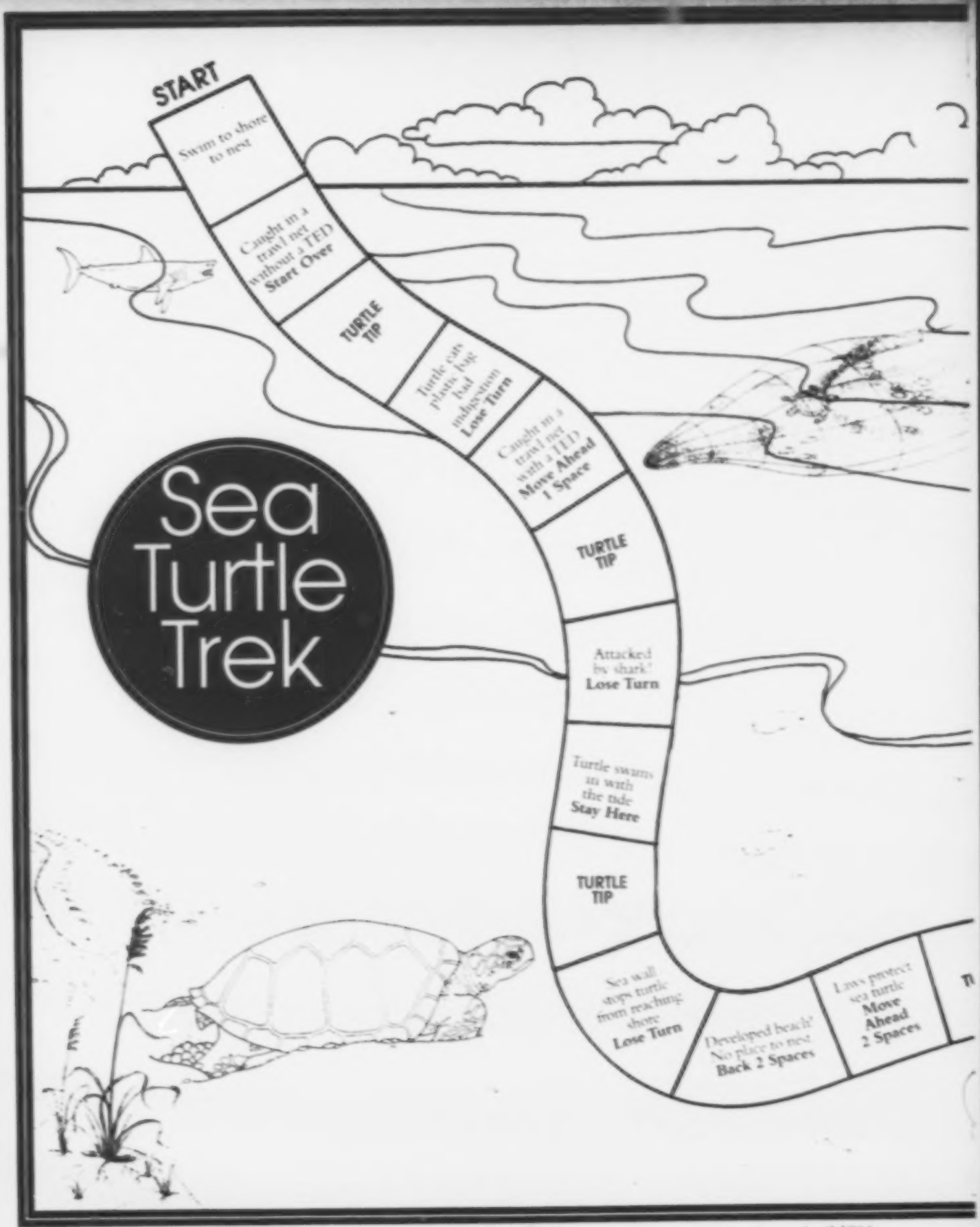
Turtle Tip Cards

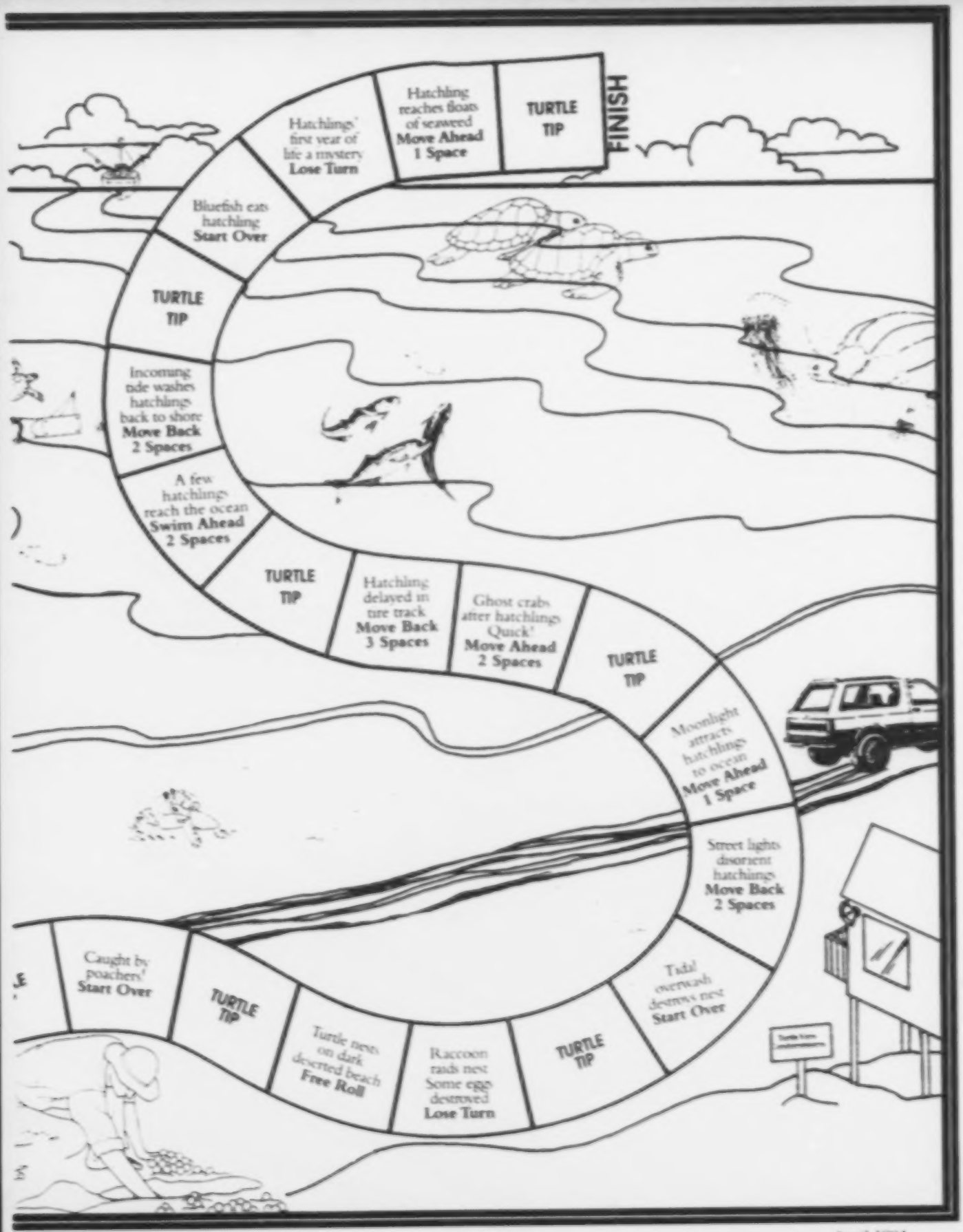
Which of the following has a positive effect on sea turtles? A. Pollution in the ocean B. Nets without turtle excluder devices C. Coastal development D. Undeveloped beaches **ANSWER: D**	**Do laws protect sea turtles in the U.S.?** **ANSWER: Yes**	**What is the name of the device that allows sea turtles to escape from shrimp trawler nets?** **ANSWER:** **Turtle Excluder Device**

A Maze of Threats



Start at the top of the maze as a hatchling and finish at the bottom as an adult sea turtle. Watch out for hazards along the way!


START
Swim to shore to nest
Caught in a trawl net without a TED
Start Over
TURTLE TIP
Turtle eats plastic bag
Lose Turn
Caught in a trawl net with a TED
Move Ahead 1 Space
TURTLE TIP
Attacked by shark!
Lose Turn
Turtle swims in with the tide
Stay Here
TURTLE TIP
Sea wall stops turtle from reaching shore
Lose Turn
Developed beach! No place to nest
Back 2 Spaces
Laws protect sea turtle
Move Ahead 2 Spaces
Sea Turtle Trek


FINISH
Hatchling reaches floats of seaweed **Move Ahead 1 Space**
TURTLE TIP
Hatchlings' first year of life a mystery **Lose Turn**
Bluefish eats hatchling **Start Over**
TURTLE TIP
Incoming tide washes hatchlings back to shore **Move Back 2 Spaces**
A few hatchlings reach the ocean **Swim Ahead 2 Spaces**
TURTLE TIP
Hatchling delayed in tire track **Move Back 3 Spaces**
Ghost crabs after hatchlings Quick! **Move Ahead 2 Spaces**
TURTLE TIP
Moonlight attracts hatchlings to ocean **Move Ahead 1 Space**
Street lights disorient hatchlings **Move Back 2 Spaces**
Tidal overwash destroys nest **Start Over**
TURTLE TIP
Raccoon raids nest Some eggs destroyed **Lose Turn**
Turtle nests on dark, deserted beach **Free Roll**
TURTLE TIP
Caught by poachers! **Start Over**

Hammocks Beach State Park, NC 5.1.15 April 1994

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Major Concepts:
- Endangered species
- Migration
- Latitude and longitude
- International resource management

Learning Skills:
- Observing, measuring, communicating
- Map reading, using information for decision-making
- Applying and expanding information
- Computing, using spatial models

Subject Areas:
- Science
- Social Studies
- Mathematics
- English Language Arts
- See the **Activity Summary** for a Correlation with DPI objectives in these subject areas.

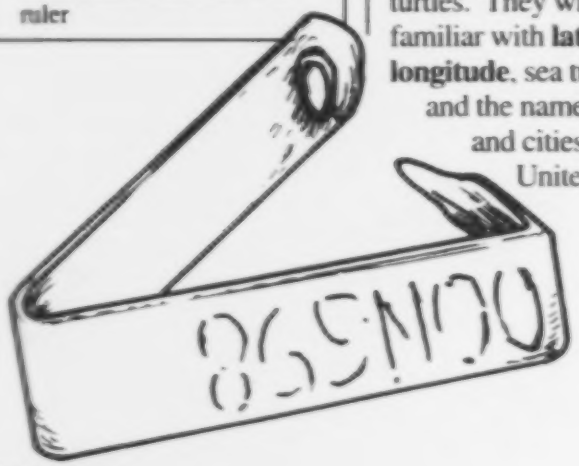
Location: Classroom

Group Size: 30, class size

Estimated Time:
One to two class periods

Appropriate Season: Any

Materials:
Provided by the educator:
Per student: one copy of the Student's Information, Turtle Statistics Card, Sea Turtle Tracking Chart and Sea Turtle Worksheet; calculator and ruler



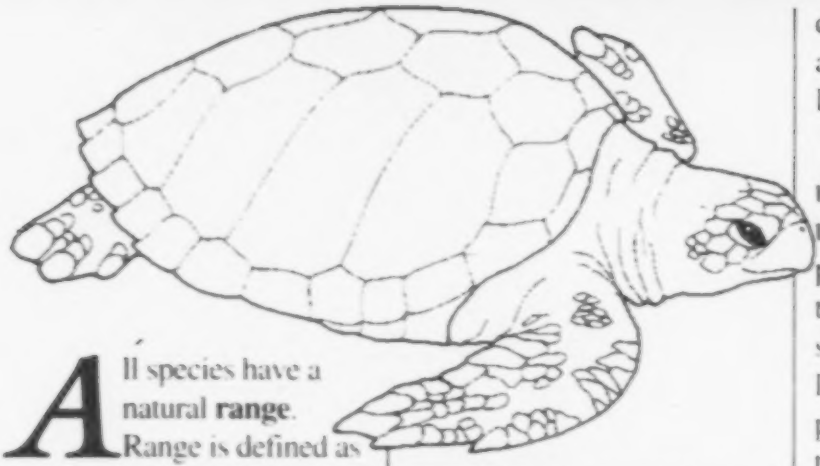
Objectives:

- Know the names and locations of two countries in the Western Hemisphere and two major cities within these countries.
- List two methods used to tag turtles.
- Demonstrate the ability to correctly identify specific latitudes and longitudes on a map.
- Demonstrate the ability to calculate distances using a map scale.

Educator's Information:

This activity is designed to give the students hands on experience in analyzing data collected from tagged sea turtles. They will become familiar with **latitude** and **longitude**, sea turtle **ranges**, and the names of countries and cities outside the United States.

Student's Information



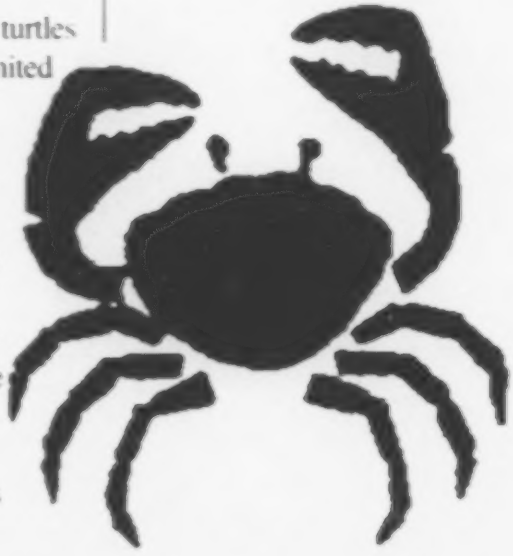
All species have a natural **range**. Range is defined as the areas in the world that a particular plant or animal is *normally* found. The range of the loggerhead sea turtle is temperate and subtropical waters worldwide; however, loggerheads are occasionally found in areas outside their normal range. For example, research has shown that loggerheads are regular visitors to the northeast coast of the United States during the summer months. The loggerhead nests farther from the tropics than other sea turtles. In the United States the loggerheads nest from Florida north to North Carolina.

Several private organizations and federal, state and local governments are working to protect sea turtles. Through federal, state and international agreements, laws have been enacted to protect and promote population recoveries. In 1973 the **Endangered Species** Act was passed, making it a violation to "harass, harm, pursue, hunt, shoot, wound, kill, capture, or collect endangered species." It also "provides for acquisition and/or protection of turtle nesting habitat, establishment of marine sanctuaries for turtle protection." The law provides for production of a list identifying species that are threatened and endangered to try to protect them from becoming **extinct**.

Even though all sea turtles are protected by the United States Endangered Species Act, they are only protected by this Act while they are in US waters. Sea turtles are great travelers, often traveling far outside their normal range as they **migrate** to nesting beaches. In their travels, sea turtles cross international boundaries. When they do this, the laws governing them change.

In poor countries, sea turtles are very valuable for their meat and eggs (high in protein), and for the products that can be made from their skins and shells, such as leather and jewelry. The people in these countries sometimes do not understand why sea turtles should be protected. Government leaders and researchers have to address these social issues when they try to develop **resource management** plans and laws that protect sea turtles.

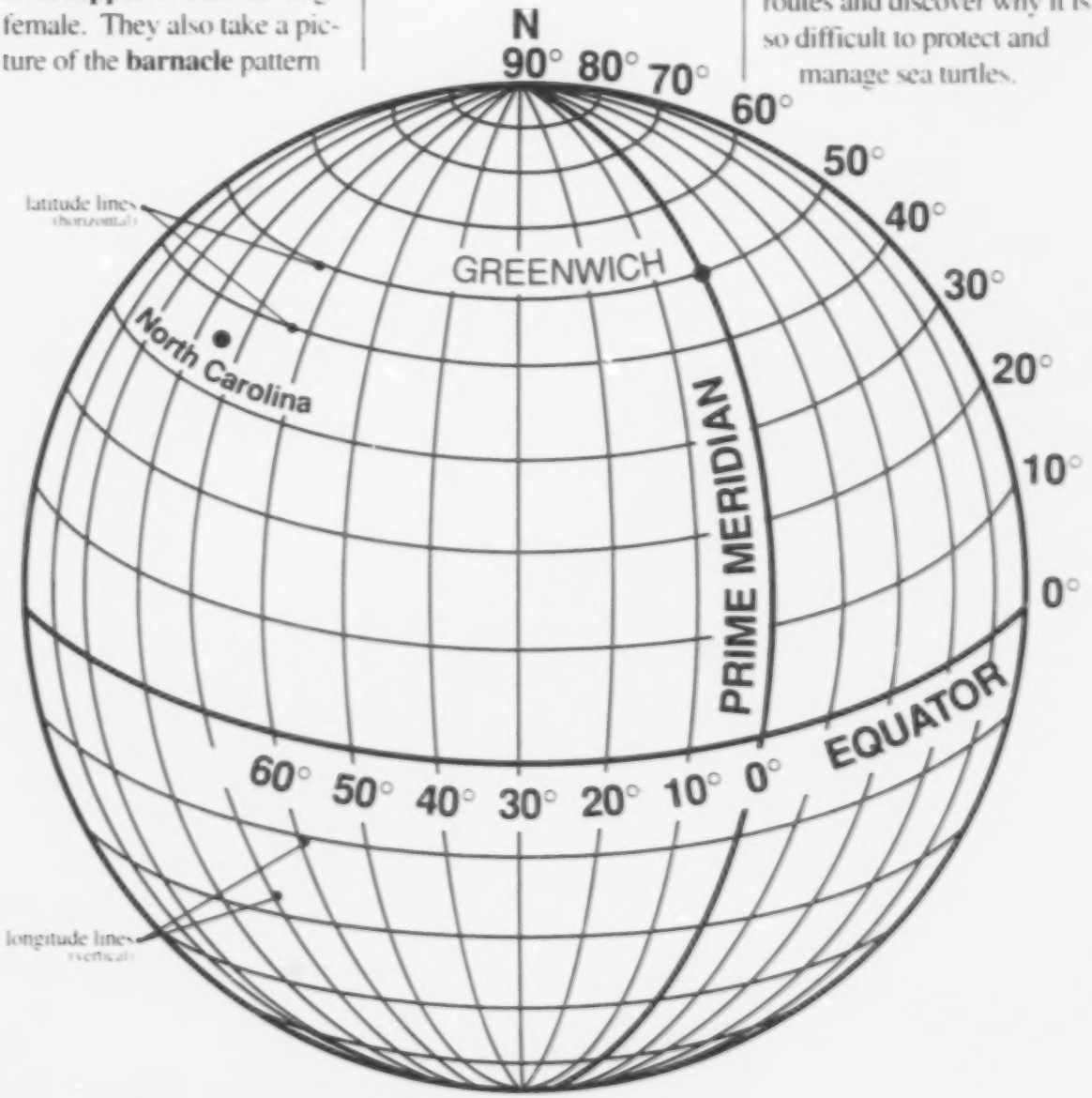
To develop better resource management plans, we need to know as much about a sea turtle's life history as possible. Since sea turtles spend all their lives in the ocean,



they are very hard to observe and study. Sea turtle researchers get most of their data from female sea turtles that come ashore to nest. One method used to obtain information on sea turtle numbers and their range is by tagging them. Turtles may be tagged several ways. At Hammocks Beach, researchers attach a metal tag to the front **flipper** of each nesting female. They also take a picture of the **barnacle** pattern on the turtle's **carapace**. If another researcher finds a tagged turtle, he or she will report the information on the tag to the National Marine Fisheries Service. The data collected on each turtle can be used to determine how far that particular turtle traveled, how long it took, and the condition of the turtle during its travels.

Another method used to tag turtles is to attach a device that emits a signal that can be picked up by telemetry equipment or even tracked by satellite. The satellite tracking method provides excellent data but is very expensive.

In the following activity you will analyze data on an imaginary sea turtle. You will explore sea turtle migration routes and discover why it is so difficult to protect and manage sea turtles.



Instructions:

1. Prepare the handouts listed under Materials. Distribute the Student's Information to each student and review terms- **range, migrate** and **endangered species**.

2. Hand out the Turtle Tracking Chart to each student and explain **latitude** and **longitude**. Latitude refers to the lines that run *horizontally* across maps or globes. Latitude is measured in degrees from the equator. All latitude lines above the equator are north latitudes. The latitude lines on the Turtle Tracking Chart are indicated by a series of dots. The dotted latitude lines are labelled on the right side of the chart and go from 10 degrees up to 45 degrees.

Longitude refers to the lines that run *vertically* on a map or globe. Longitude is measured in degrees from Greenwich, England. The longitude lines on the Turtle Tracking Chart are indicated by a series of dots. The dotted longitude lines are labelled across the bottom of the chart and range from 45 to 105 degrees. Longitudes west of Greenwich, England, are west longitudes.

3. During this activity, students will be asked to pinpoint turtle locations on a map. Each point will have a latitude and longitude number which students will use to plot the point on the map. They will also use the map scale to estimate the distance between points. On this scale, one-eighth of an inch (or 3.5 mm) equals approximately 50 **nautical miles**. (A nautical mile is about 6,076 feet, or 1.15 terrestrial miles, and is used for air and water travel.) Do a guided practice using the example below.

Example:

A turtle was recorded at the following coordinates: 15 degrees North latitude and 60 degrees West longitude. First locate where these two coordinates meet (just east of the island of Martinique). Mark this point on the map with a dot and circle it for visibility. The next coordinate for this turtle is 16 degrees North and 60 degrees West. Mark it on your map with a dot and circle it.

There are several ways to measure the distance between these two points. One way is to use a ruler to draw a line connecting the points. Cut out the map scale and place it along the line to determine the length of the line in nautical miles. Another method is to measure the line to find out how many eighths are contained in the line. Then, multiply by 50 to convert to nautical miles. Your students may suggest other techniques. As long as they are within 25 miles of the correct answer, their answer is acceptable. The correct answer for this example is 60 nautical miles. (We are assuming that the turtle swam in a straight line from one point to the next.)

4. Distribute the Sea Turtle Statistics Card, Sea Turtle Worksheet, calculators and rulers. The students could work individually or in teams to answer the questions on the worksheet.

Suggested Extensions:

1. Write to request information on 10 to 15 sea turtles that have been tagged. Be sure to ask for information on different species. The address is: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Miami Florida Lab, 75 Virginia Beach Drive, Miami FL 33149.

Once you receive the information, you can use the Turtle Tracking Chart to plot the travels of the turtles and calculate distances if desired.

2. Students could do some creative writing by making a journal or log book of one of the turtle's travels from the turtle's point of view or from a human's point of view (if a human were in a boat and followed the turtle's route).

Sea Turtle Statistics Card

Species: Loggerhead - *Caretta caretta*

Sex: Female

Date Tagged: July 27, 1990

Location Tagged: Bear Island, Swansboro, NC, USA - 34.5 degrees North latitude and 77.0 degrees West longitude

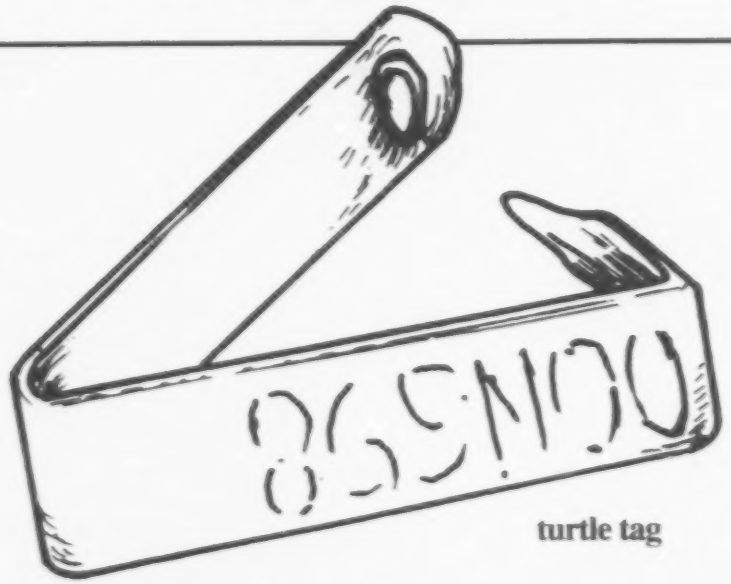
Tag Number: BEAR34

Method(s) Used To Tag: satellite transmitter attached to carapace and metal tag attached to front right flipper

Carapace Length: 38 inches **Carapace Width:** 30 inches

Location Of Movements Since Tagged:

Date	Location
8-02-90	33N - 79W
8-04-90	32N - 80W
8-17-90	29N - 79W
8-27-90	25N - 75W
9-06-90	19N - 66W



turtle tag

Sea Turtle Worksheet

Instructions:

Use the Sea Turtle Tracking Chart and Sea Turtle Statistics Card to answer the questions below.

1. What were the latitude and longitude where the turtle nested on July 27, 1990?

_____

Mark and circle the point where the latitude and longitude meet on the Turtle Tracking Chart.

2. Find the turtle's latitude and longitude on 8-2-90. Circle this point on your chart. How many miles did the turtle travel from its last known point? (Assume the turtle swam in a straight line.)

_____

3. What city is just west of the turtle's location on 8-2-90?

_____

4. Find the turtle's latitude and longitude on 8-4-90. Circle this point on your chart. How many miles did the turtle travel from its last known point?

_____

5. What is the name of the island that is <u>east</u> of the turtle's location on 8-4-90?

_____

6. Find the turtle's latitude and longitude on 8-17-90. Circle this point on your chart. How many miles did the turtle travel from its last known point?

_____

7. Find the turtle's latitude and longitude on 8-27-90. Circle this point on your chart. How far did the turtle travel from its last known point?

_____

8. What is the name of the islands that are west of the turtle's location on 8-27-90?

_____

9. Find the turtle's latitude and longitude on 9-6-90. Circle this point on your chart. How far did the turtle travel from its last known point?

_____

10. What is the name of the city in Puerto Rico that is just south of the turtle's location on 9-6-90?

_____

11. How many miles did the turtle travel from the time it was tagged to the last known location on 9-6-90?

_____

12. How many miles per day did the turtle travel from the time it was tagged to 9-6-90?

_____

13. If the turtle were recorded at Grand Cayman Island, what would be the latitude and longitude?

_____

14. What is the name of the peninsula just west of Grand Cayman Island?

_____

15. On June 25, 1991 this turtle was caught in a fishing net at 40N - 70W. Circle this point on your chart. How many miles did the turtle travel from its last known point, (in a straight line)?

_____

16. The U.S. territorial waters extend about 200 miles off the U.S. coast. Use your map scale to help you estimate 200 miles. Then, lightly draw in the 200-mile "border" on your chart from Key West, Florida, up the coast to about Boston, Massachusetts. U.S. laws apply within these territorial waters. (One exception would be the waters around the country of Cuba, which is only about 90 miles from Florida.)

17. Now review the turtle's travels on your chart. What areas on the turtle's migration route do you think were the most dangerous for the turtle? Why? _____

_____

_____

_____

Bonus Question

Convert all nautical mile answers to kilometers. (There are **1.85 km** in each nautical mile.)

Question #2 _____

Question #4 _____

Question #6 _____

Question #7 _____

Question #9 _____

Question #11 _____

Question #12 _____

Question #15 _____

Answer Sheet For Sea Turtle Worksheet

Note: Numerical answers will vary depending on measuring technique used.

1. What were the latitude and longitude where the turtle nested on July 27, 1990?
34.5N - 77W

Mark and circle the point where the latitude and longitude meet on the Turtle Tracking Chart.

2. Find the turtle's latitude and longitude on 8-2-90. Circle this point on your chart. How many miles did the turtle travel from its last known point? (Assume the turtle swam in a straight line.)
150 nautical miles, 278 kilometers

3. What city is just west of the turtle's location on 8-2-90? ***Charleston, SC***

4. Find the turtle's latitude and longitude on 8-4-90. Circle this point on your chart. How many miles did the turtle travel from its last known point?
100 nautical miles, 185 kilometers

5. What is the name of the island that is east of the turtle's location on 8-4-90? ***Bermuda***

6. Find the turtle's latitude and longitude on 8-17-90. Circle this point on your chart. How many miles did the turtle travel from its last known point?
200 nautical miles, 370 kilometers

7. Find the turtle's latitude and longitude on 8-27-90. Circle this point on your chart. How far did the turtle travel from its last known point? ***350 nautical miles, 648 kilometers***

8. What is the name of the islands that are west of the turtle's location on 8-27-90?
Bahama Islands

9. Find the turtle's latitude and longitude on 9-6-90. Circle this point on your chart. How far did the turtle travel from its last known point? ***650 nautical miles or 1,203 kilometers***

10. What is the name of the city in Puerto Rico that is just south of the turtle's location on 9-6-90? ***San Juan***

11. How many miles did the turtle travel from the time it was tagged to the last known location on 9-6-90?
1,450 nautical miles or 2,683 kilometers

12. How many miles per day did the turtle travel from the time it was tagged to 9-6-90?
35 nautical miles/day (1,450 nautical miles in 41 days)

13. If the turtle were recorded at Grand Cayman Island, what would be the latitude and longitude?
19.5 or 19N - 81.3 or 81W

14. What is the name of the peninsula just west of Grand Cayman Island?
Yucatan Peninsula

15. On June 25, 1991 this turtle was caught in a fishing net at 40N - 70W. Circle this point on your chart. How many miles did the turtle travel from its last known point, (in a straight line)? ***1,375 nautical miles or 2,544 km***

16. The U.S. territorial waters extend about 200 miles off the U.S. coast. Use your map scale to help you estimate 200 miles. Then, lightly draw in the 200-mile "border" on your chart from Key West, Florida, up the coast to about Boston, Massachusetts. U.S. laws apply within these territorial waters. (One exception would be the waters around the country of Cuba, which is only about 90 miles from Florida.) ***See answer key for Turtle Tracking Chart***

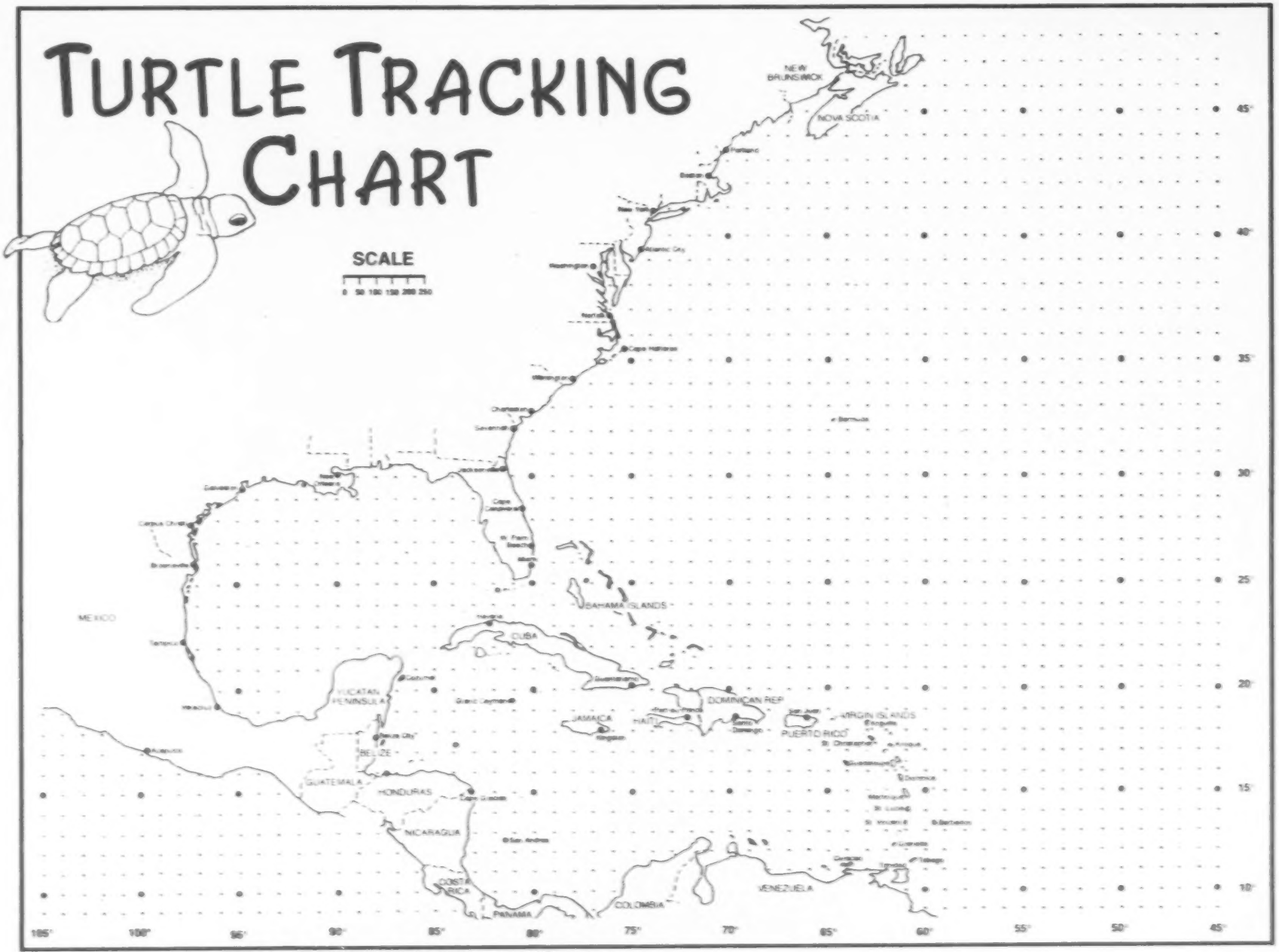
17. Now review the turtle's travels on your chart. What areas on the turtle's migration route do you think were the most dangerous for the turtle? Why? ***The answers may vary. Probably the area from the Bahamas down to the area near Puerto Rico would be the most dangerous. In this area, the turtle may venture out of U.S. territorial waters and would no longer be protected by the U.S. Endangered Species Act. Other dangers to the turtle would include areas of heavy fishing activity and areas where there might be more sharks.***

Bonus Questions

Convert all nautical mile answers to kilometers. (There are **1.85 km** in each nautical mile.) **Answers will vary.**

Question #2	278
Question #4	185
Question #6	370
Question #7	648
Question #9	1,203
Question #11	2,683
Question #12	65
Question #15	2,544

TURTLE TRACKING CHART



Adapted from National Oceanic and Atmospheric Administration *Hurricane Tracking Chart*, Department of Commerce

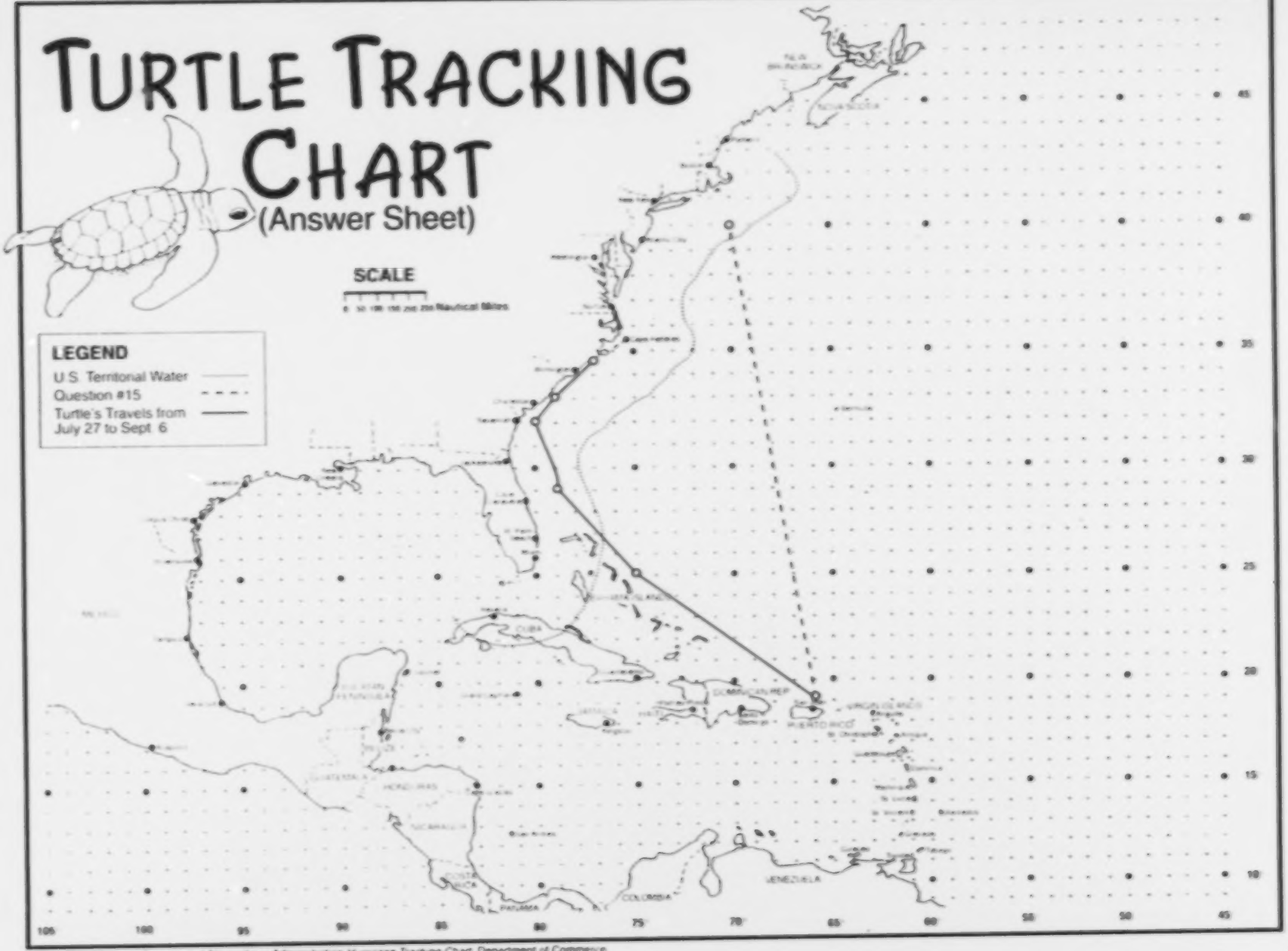
Hammocks Beach State Park, NC

5.2.10

March 1994

TURTLE TRACKING CHART

(Answer Sheet)



Adapted from National Oceanic and Atmospheric Administration *Hurricane Tracking Chart* Department of Commerce

March 1994

5.2.11

Hummocks Beach State Park, NC

Post-Visit Activity 3 — Nest Management

Major Concepts:
- Resource management
- Endangered species

Learning Skills:
- Interpreting data, inferring, predicting, communicating
- Averaging, graphing, using statistics
- Analyzing and applying information

Subject Areas:
- Science
- Mathematics
- Communication skills
- *See the **Activity Summary** for a Correlation with DPI objectives in these subject areas.

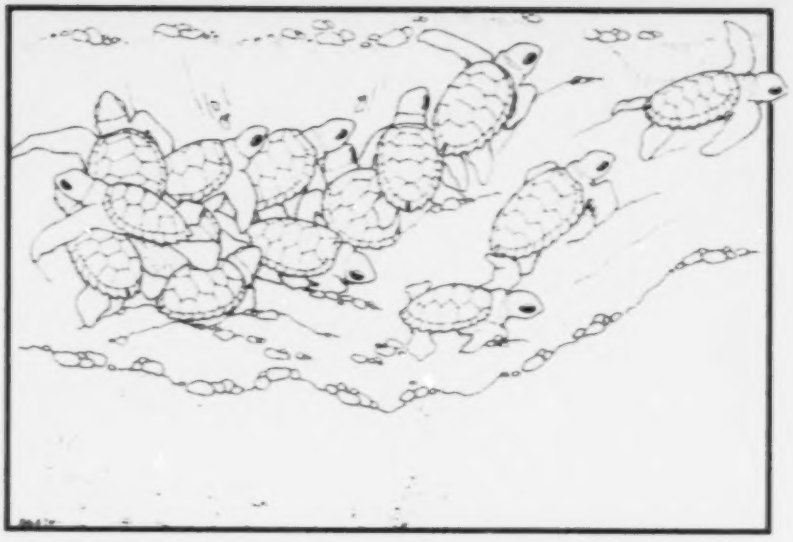
Location: Classroom

Group Size: 20-30 students

Estimated Time:
One to two class periods

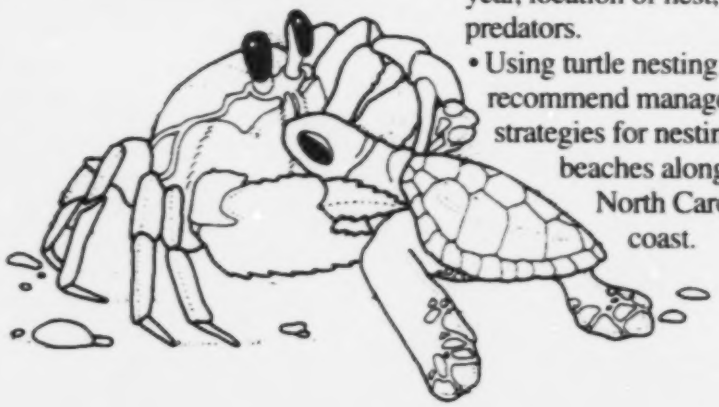
Appropriate Season: Any

Materials:
Provided by the educator:
Per class: one copy of 1992 Nest Data Cards
Per student/group: Student's Information, Bear Island Turtle Nest Data Sheet, graph paper and calculator



Objectives:

- Calculate correctly the incubation period and hatching success for individual turtle nests.
- Calculate averages for turtle nests on Bear Island in 1992, such as average hatching success, average number of eggs laid, average number of eggs hatched, and average incubation period.
- List at least three factors affecting hatching success such as weather, time of year, location of nest, and predators.
- Using turtle nesting data, recommend management strategies for nesting beaches along the North Carolina coast.



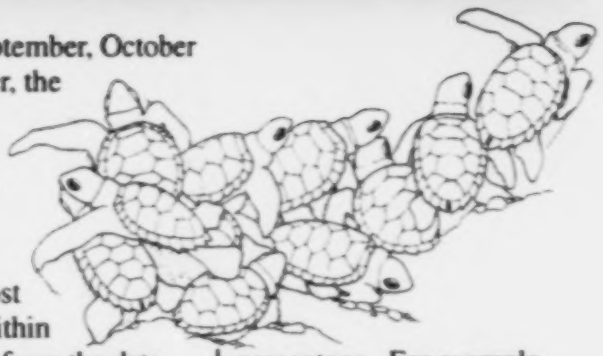
Educator's Information:

The students will be responsible for compiling and analyzing **nesting** data for 1992 from Bear Island, Hammocks Beach State Park. Each student, or student team, will calculate the **incubation period** and **hatching success** for at least one turtle nest. Then they will calculate averages for the 42 nests laid in 1992 and recommend management strategies based on the available data. Graphing and other skills in probability and statistics are possible depending on the direction that the teacher wishes to take the lesson. The teacher may also want to review the information on loggerhead sea turtles presented in Appendices 2 and 3.

Student's Information

During the months of June, July and August, park staff spend all night, every night looking for nesting sea turtles. They try to tag as many turtles as possible. They place a metal tag on the front **flipper** of each turtle they find and make a **photo tag** of the **barnacle** pattern on the turtle's **carapace**. The park staff also record the date the nest was made, mark the nest, and cover it with fence wire to protect it from **predators** such as raccoons and foxes.

During September, October and November, the park staff check the nests periodically to look for signs of hatching. Most nests hatch within 60 to 90 days from the date that the eggs were laid. The number of days that it takes the eggs to hatch is called the **incubation period.** The park staff record the date that each nest hatched, then they dig up the nest to count the number of empty eggshells and unhatched eggs. With this information, they can calculate the total number of eggs that were laid. The staff also count any dead turtles they find in the nest and rescue live turtles that did not make it out with the main group. If a nest has not hatched after 80-90 days, the staff will excavate the nest and record their observations.



Hatching success is a very important statistic for sea turtle researchers. The park staff calculate the hatching success for each nest by dividing the number of eggs that hatched by the total number of eggs that were laid. They multiply this number by 100 to get a percentage. For example, if a nest contains a total of 120 eggs and if 60 eggs hatch, this nest has a 50% hatching success. [60 ÷ 120 x 100 = 50%] This means that one-half of all the eggs laid hatched successfully. On Bear Island, it is not uncommon for nests to have a hatching success of over 50%. This is one reason why Bear Island is an important sea turtle nursery.

On Bear Island in 1992, the park staff observed a total of 42 loggerhead sea turtle nests. They also recorded 49 "false crawls." A false crawl occurs when a female turtle comes up on the beach but does not actually nest. In the following activity, you will be analyzing and compiling data from the actual 1992 nest records from Hammocks Beach State Park.

Instructions:

1. Make one copy of each page of the 1992 Nest Data Cards and cut out the individual cards. Copy the Student's Information and Bear Island Turtle Nest Data Sheet for each student or team of students.

2. Students should read the Student's Information and discuss the new terms, incubation period and hatching success.

3. Explain that each student, or team of students, will be calculating the incubation period and hatching success for one to three turtle nests. The information needed to do the calculations is contained on the 1992 Nest Data Cards. Do a guided practice with Nest Card #1 to demonstrate how to calculate incubation period. Remind the students that the months of June and September have only 30 days, while the months of May, July, August and October have 31 days. [For card #1: (31-24) + 30 + 31 + 14 = 82 days] Also demonstrate how to calculate hatching success by dividing the number of eggs hatched by the number of eggs laid. Discuss percent, especially if this is an unfamiliar concept to your students. [For card #1: 44/102 x 100 = 43%]

4. Divide the students into teams of two. Each team should get two or three nest cards. (There are 42 nest data cards in all.) Each student should do the calculations for one nest and then ask a team member to check his or her work. You may wish to give the students time to share their results with the rest of the class. Which nest had the greatest/smallest number of eggs laid? Which nest had the greatest/smallest number of eggs hatch? Which nest had the longest/shortest incubation period? Which nest had the best hatching success?

5. Give one copy of the Bear Island Turtle Nest Data Sheet to each team and ask them to check their answers. (Optional: The educator could also make a transparency of this data sheet for the overhead.) Give each team a calculator and ask them to calculate the averages for the 1992 nests (page 2 of the Bear Island Turtle Nest Data Sheet). Depending on time and the mathematics skills of the students, the educator could assign each team one of the four averages to calculate or all the averages. These should be reported on the board or overhead. Students can then compare their nests with the average and comment verbally or in writing.

6. Give each team two sheets of graph paper and ask students to graph hatching success versus the date that the nest was laid. They could do a second graph of incubation period versus the date the nest was laid. What conclusions can be made from studying the graphs? Do the students notice any trends in the data? What inferences can they make regarding the factors that may influence hatching success? What predictions can they make about turtle eggs laid in certain months? Also let each team develop **resource management** recommendations for managing sea turtle nesting beaches. Their recommendations should be based on the nesting data and also on other information they have learned about sea turtles during their trip to Hammocks Beach State Park.

Answers for Bear Island Turtle Nest Data Sheet

Totals, page one

Number of days (incubation period) = 2,101
Number of eggs laid = 3,759
Number of eggs hatched = 2,947
Hatching success totals = 2,341

Totals, page two

Number of days (incubation period) = 730
Number of eggs laid = 1,433
Number of eggs hatched = 877
Hatching success totals = 746

Overall totals, page two

Number of days (incubation period) = 2,831
Number of eggs laid = 5,192
Number of eggs hatched = 3,824
Hatching success totals = 3,087

Averages (a "typical" loggerhead nest on Bear Island in 1992)

Average incubation period = 71 days
Average hatching success = 74%
Average number of eggs laid = 124
Average number of eggs hatched = 91

1992 Nest Data Cards

Nest #1
Date Laid: 5-24-92
Date Hatched: 8-14-92
Eggs Laid: 102
Eggs Hatched: 44

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #4
Date Laid: 6-7-92
Date Hatched: 8-18-92
Eggs Laid: 131
Eggs Hatched: 121

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #2
Date Laid: 6-5-92
Date Hatched: 8-14-92
Eggs Laid: 98
Eggs Hatched: 46

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #5
Date Laid: 6-9-92
Date Hatched: 8-22-92
Eggs Laid: 155
Eggs Hatched: 68

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #3
Date Laid: 6-7-92
Date Hatched: 8-16-92
Eggs Laid: 161
Eggs Hatched: 54

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #6
Date Laid: 6-11-92
Date Hatched: 8-29-92
Eggs Laid: 150
Eggs Hatched: 135

Incubation Period: _____ **days**
Hatching Success: _____ %

1992 Nest Data Cards

Nest #7
Date Laid: 6-11-92
Date Hatched: 8-25-92
Eggs Laid: 143
Eggs Hatched: 96

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #10
Date Laid: 6-22-92
Date Hatched: 8-29-92
Eggs Laid: 35
Eggs Hatched: 24

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #8
Date Laid: 6-11-92
Date Hatched: 8-22-92
Eggs Laid: 144
Eggs Hatched: 58

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #11
Date Laid: 6-24-92
Date Hatched: 9-9-92
Eggs Laid: 110
Eggs Hatched: 99

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #9
Date Laid: 6-21-92
Date Hatched: 8-29-92
Eggs Laid: 144
Eggs Hatched: 109

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #12
Date Laid: 6-24-92
Date Hatched: 9-11-92
Eggs Laid: 106
Eggs Hatched: 85

Incubation Period: _____ **days**
Hatching Success: _____ **%**

1992 Nest Data Cards

Nest #13
Date Laid: 6-24-92
Date Hatched: 8-30-92
Eggs Laid: 123
Eggs Hatched: 97

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #16
Date Laid: 6-27-92
Date Hatched: 8-30-92
Eggs Laid: 91
Eggs Hatched: 56

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #14
Date Laid: 6-24-92
Date Hatched: 9-2-92
Eggs Laid: 117
Eggs Hatched: 46

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #17
Date Laid: 6-28-92
Date Hatched: 9-10-92
Eggs Laid: 154
Eggs Hatched: 150

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #15
Date Laid: 6-26-92
Date Hatched: 8-25-92
Eggs Laid: 139
Eggs Hatched: 113

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #18
Date Laid: 6-29-92
Date Hatched: 9-2-92
Eggs Laid: 113
Eggs Hatched: 101

Incubation Period: _____ **days**
Hatching Success: _____ **%**

1992 Nest Data Cards

Nest #19
Date Laid: 7-8-92
Date Hatched: 9-11-92
Eggs Laid: 134
Eggs Hatched: 128

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #22
Date Laid: 7-9-92
Date Hatched: 9-17-92
Eggs Laid: 125
Eggs Hatched: 122

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #20
Date Laid: 7-8-92
Date Hatched: 9-17-92
Eggs Laid: 116
Eggs Hatched: 116

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #23
Date Laid: 7-12-92
Date Hatched: 9-18-92
Eggs Laid: 111
Eggs Hatched: 70

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #21
Date Laid: 7-9-92
Date Hatched: 9-10-92
Eggs Laid: 133
Eggs Hatched: 128

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #24
Date Laid: 7-13-92
Date Hatched: 9-23-92
Eggs Laid: 149
Eggs Hatched: 139

Incubation Period: _____ **days**
Hatching Success: _____ %

1992 Nest Data Cards

Nest #25
Date Laid: 7-15-92
Date hatched: 9-20-92
Eggs Laid: 145
Eggs Hatched: 137

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #28
Date Laid: 7-21-92
Date Hatched: 10-2-92
Eggs Laid: 128
Eggs Hatched: 125

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #26
Date Laid: 7-16-92
Date Hatched: 9-18-92
Eggs Laid: 152
Eggs Hatched: 147

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #29
Date Laid: 7-22-92
Date Hatched: 9-28-92
Eggs Laid: 86
Eggs Hatched: 83

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #27
Date Laid: 7-21-92
Date Hatched: 9-26-92
Eggs Laid: 126
Eggs Hatched: 120

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #30
Date Laid: 7-24-92
Date Hatched: 9-29-92
Eggs Laid: 138
Eggs Hatched: 130

Incubation Period: _____ **days**
Hatching Success: _____ **%**

1992 Nest Data Cards

Nest #31
Date Laid: 7-25-92
Date Hatched: 10-3-92
Eggs Laid: 111
Eggs Hatched: 83

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #34
Date Laid: 7-26-92
Date Hatched: 9-28-92
Eggs Laid: 145
Eggs Hatched: 138

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #32
Date Laid: 7-25-92
Date Hatched: 9-29-92
Eggs Laid: 102
Eggs Hatched: 99

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #35
Date Laid: 7-26-92
Date Hatched: 10-3-92
Eggs Laid: 99
Eggs Hatched: 85

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #33
Date Laid: 7-26-92
Date Hatched: 9-29-92
Eggs Laid: 138
Eggs Hatched: 133

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #36
Date Laid: 7-26-92
Date Hatched: 10-3-92
Eggs Laid: 105
Eggs Hatched: 94

Incubation Period: _____ **days**
Hatching Success: _____ %

Nest #37
Date Laid: 7-27-92
Date Hatched: 10-2-92
Eggs Laid: 141
Eggs Hatched: 135

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #40
Date Laid: 8-8-92
Date Hatched: N/A
Excavated 11-5-92
Eggs Laid: 130
Eggs Hatched: 0

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #38
Date Laid: 8-7-92
Date Hatched: 10-28-92
Eggs Laid: 98
Eggs Hatched: 66

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #41
Date Laid: 8-9-92
Date Hatched: 11-5-92
Eggs Laid: 186
Eggs Hatched: 20

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #39
Date Laid: 8-7-92
Date Hatched: 11-5-92
Eggs Laid: 73
Eggs Hatched: 24

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Nest #42
Date Laid: 8-19-92
Date Hatched: N/A
Excavated 11-5-92
Eggs Laid: 105
Eggs Hatched: 0

Incubation Period: _____ **days**
Hatching Success: _____ **%**

Bear Island Turtle Nest Data Sheet

Nest #	Date Laid	Incubation Period (days)	# Eggs Laid	#Eggs Hatched	Hatching Success
1	5-24-92	82	102	44	43%
2	6-5-92	70	98	46	47%
3	6-7-92	70	161	54	34%
4	6-7-92	72	131	121	92%
5	6-9-92	74	155	68	44%
6	6-11-92	79	150	135	90%
7	6-11-92	75	143	96	67%
8	6-11-92	72	144	58	40%
9	6-21-92	69	144	109	76%
10	6-22-92	68	35	24	69%
11	6-24-92	77	110	99	90%
12	6-24-92	79	106	85	80%
13	6-24-92	67	123	97	79%
14	6-25-92	69	117	46	40%
15	6-26-92	60	139	113	81%
16	6-27-92	64	91	56	62%
17	6-28-92	74	154	150	97%
18	6-29-92	65	113	101	89%
19	7-8-92	65	134	128	96%
20	7-8-92	71	116	116	100%
21	7-9-92	63	133	128	96%
22	7-9-92	70	125	122	98%
23	7-12-92	68	111	70	63%
24	7-13-92	72	149	139	93%
25	7-15-92	67	145	137	94%
26	7-16-92	64	152.	147	97%
27	7-21-92	67	126	120	95%
28	7-21-92	73	128	125	98%
29	7-22-92	68	86	83	97%
30	7-24-92	67	138	130	94%
Totals:					

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Bear Island Turtle Nest Data Sheet (cont.)

Nest #	Date Laid	Incubation Period (days)	# Eggs Laid	#Eggs Hatched	Hatching Success
31	7-25-92	70	111	83	75%
32	7-25-92	66	102	99	97%
33	7-26-92	65	138	133	96%
34	7-26-92	64	145	138	95%
35	7-26-92	69	99	85	86%
36	7-26-92	69	105	94	90%
37	7-27-92	67	141	135	96%
38	8-7-92	82	98	66	67%
39	8-7-92	90	73	24	33%
40	8-8-92	N/A	130	0	0%
41	8-9-92	88	186	20	11%
42	8-19-92	N/A	105	0	0%
Totals: (this page)					
Overall Totals: 42 Nests					

Calculate:

Average Incubation Period = $\frac{\text{Total Incubation}}{\text{*40 nests}}$ = _____
*(note: 2 nests did not hatch)

Average Hatching Success = $\frac{\text{Total Hatching Success}}{\text{42 nests}}$ = _____

Average No. of Eggs Laid = $\frac{\text{Total No. Eggs Laid}}{\text{42 nests}}$ = _____

Average No. of Eggs Hatched = $\frac{\text{Total No. Eggs Hatched}}{\text{42 nests}}$ = _____

VOCABULARY

Adaptation - A change in the structure or activity of an organism that produces a better adjustment to its environment, thus enhancing its ability to survive and reproduce. For example, the huge head and powerful jaws of a loggerhead sea turtle are adaptations that allow the loggerhead to feed on hard-shelled mollusks.

Anatomy - The branch of biology that deals with the structure of plants and animals.

Arribada - A Spanish word that means arrival. Used to describe the arrival of masses of Kemps Ridley sea turtles at their nesting beaches.

Barnacle - A cone-shaped saltwater shellfish that attaches itself to the shells of sea turtles and other hard surfaces.

Beach - A smooth stretch of sand or pebbles along the shore of the ocean.

Beak - The horny covering of the jaws, in turtles consisting of a single plate over each jaw surface.

Camouflage - A means of concealment – blending in with natural surroundings.

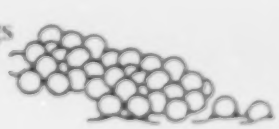
Carapace - The top (dorsal) part of the turtle's shell, usually covered by scutes.

Carnivore - A meat eating animal.

Classification - The grouping of organisms into categories based on shared characteristics or traits.

Cloaca - The cavity into which the intestinal, genital, and urinary tracts open in vertebrate animals such as fish, reptiles, birds, and primitive mammals.

Clutch - A group of eggs laid in a single nest.



Cold-blooded - Having a body temperature that varies with the external environment. (Ectothermic)

Conservation - The protection and management of natural resources.

Crawl - The tracks a sea turtle makes, the act of a turtle moving on the beach.

Cretaceous Period - A geological time period 66 - 138 million years ago. Scientists think that sea turtles evolved during the Cretaceous Period.

Crustacean - An invertebrate animal, usually aquatic, having two pairs of antennae. Examples are lobsters, crabs and barnacles.

Dichotomous - Divided into two parts, groups or classes, such as a dichotomous key. Using a dichotomous key, one can identify an unknown organism by following the one branch of each pair of statements that best describes the organism.

Dorsal - Pertaining to the top or upperside of a plant or animal. The dorsal part of a sea turtle shell is the carapace.

Ectothermic - Pertaining to the inability to control body temperature. Reptiles, amphibians and insects are all ectotherms. Their body temperature is regulated by how warm or cold it is outside. (Cold-blooded.)

Endangered species - A species that verges on extinction in all or part of its range.

Extinct species - A plant or animal no longer in existence.

Flipper - A broad, flat limb used for swimming. The front and rear flippers of sea turtles are attached to well developed muscles for long distance water travel.

Habitat - The place where an animal lives and finds food, water, shelter and space. The place where a plant has the soil, nutrients, water and climate it needs.

Hatching Success - A percentage calculated by dividing the number of eggs hatched by the number of eggs laid, multiplying by 100.

Hatchling - A newly hatched sea turtle.

Herbivore - An animal that eats only plants.

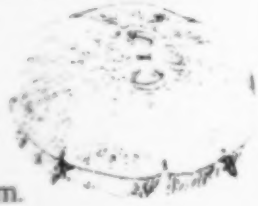
Herpetologist - A scientist who specializes in the study of reptiles and amphibians.

Incubation period - The number of days it takes an egg to hatch after it has been laid.

Inframarginal scutes - Scutes located between the marginal scutes of the carapace and the plastron. They connect the carapace to the plastron.

Invertebrate - An animal having no backbone.

Jellyfish - A floating marine invertebrate which is almost 90% water. It usually has a gelatinous, translucent body, with tentacles that entangle any prey that comes in contact with them.



Keratin - A strong, fibrous protein that is the basic substance of nails, hair, hoofs, scutes and beaks.

Key - An ordered list of significant characteristics of a group of organisms. A key is used to identify unknown species.

Lateral scutes - Scutes located on each side of the vertebral scutes on the carapace.

Latitude - Measured in degrees, the distance north or south of the equator.

Leatherback - Largest of the sea turtles, the soft-shelled leatherback lacks an outershell or scutes; it can grow to more than six feet long and weigh up to 1300 pounds.

Longitude - The distance measured in degrees east or west of the prime meridian (0 degrees longitude) at Greenwich, England.

Marginal scutes - Outermost scutes, they enclose the lateral and vertebral scutes

Migrate - To move from one region or climate to another for food or breeding.

Nautical mile - Unit of length used in sea and air navigation.

Nesting - The process of depositing eggs in a nest. Sea turtles deposit their eggs in a bell-shaped hole they dig in the sand.

Nuchal scute - A marginal scute on the carapace located closest to the neck region.

Omnivore - An animal that eats both animals and plants.

Photo tagging - The process of taking a picture of a sea turtle's carapace to use in identification. A sea turtle's carapace is usually covered with barnacles. Each turtle has a unique pattern or arrangement of barnacles. Photo tagging documents this pattern. It is comparable to finger printing in humans.

Plastron - The bottom part of the turtle's shell.

Predator - An animal that hunts another animal.

Prefrontal scute - The scutes between the eyes.

Prey - An animal that is food for a predator.

Range - The geographical region in which a plant or animal normally lives or grows.

Reptile - Any of various cold-blooded, usually egg-laying vertebrates having an external covering of scales and breathing by means of lungs, such as snakes, lizards, crocodiles and turtles.

Resource Management - The practices, such as sea turtle monitoring, which are designed to improve the habitat and survival of wildlife and/or plant communities.

Sanctuary - A refuge or safe haven where most forms of plant and animal life are offered protection.

Scales - A small platelike structure forming the external covering of fishes, reptiles and certain mammals.

Scutes - Horny plates that cover the bones of a turtle's shell, except in leatherback sea turtles.

Shell - The hard outer covering that protects certain organisms.

Subtropical - Pertaining to areas close to the tropics.

Taxonomy - A system of arranging animals and plants into natural, related groups based on some factor common to each, such as structure, embryology, biochemistry, etc.

Temperate zone - Either of two middle latitude zones of the earth, the North Temperate Zone and the South Temperate Zone, lying between 23 1/2 degrees and 66 1/2 degrees latitude north and south of the equator.

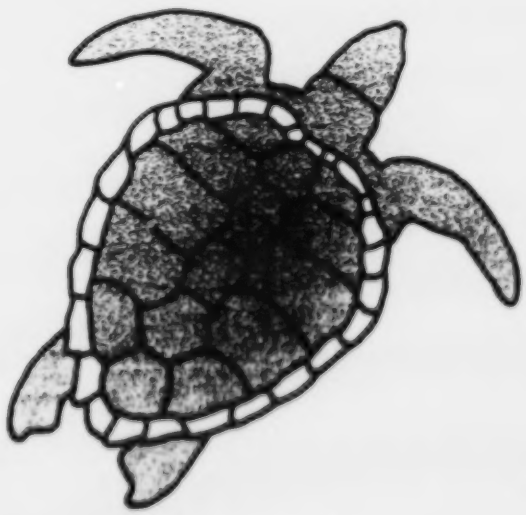
Terrestrial - Living or growing on land; not aquatic.

Threatened species - Plants or animals likely to become endangered within the foreseeable future.

Tropics - The region of the earth's surface lying between 23 degrees N latitude and 23 degrees S latitude. Also known as the Torrid Zone.

Ventral - Referring to the entire underside or bottom of a plant or animal. The ventral part of a sea turtle shell is the plastron.

Vertebrates - Animals having backbones. The five groups of vertebrates include birds, mammals, fish, reptiles and amphibians.



References

Boulon, Ralf H., Jr. 1989. "Virgin Island Turtle Tag Recoveries Outside of the US Virgin Islands," *Proceedings of the Ninth Annual Workshop of Sea Turtle Conservation and Biology.* For more information contact the National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Dr., Miami, FL 33149.

Byles, Richard A. and C. Kenneth Dodd. 1989. "Satellite Telemetry of A Loggerhead Sea Turtle From the East Coast of Florida," *Proceedings of the Ninth Annual Workshop of Sea Turtle Conservation and Biology.* For more information contact the National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Dr., Miami, FL 33149.

Carr, Archie. 1963. *"The Reptiles."* Life Nature Library. New York, NY: Time Inc.

Carr, Archie. 1967. *The Sea Turtle- So Excellent a Fishe.* Austin, TX: University of Texas Press.

Coulombe, D.A. 1984. *The Seaside Naturalist.* Englewood Cliffs, NJ: Prentice-Hall, Inc.

Federal Register "Sea Turtle Conservation." Part II. June 29, 1987. NOAA. For more information contact the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, FL 32408.

Florida Department of Natural Resources. 1988. *Sea-Stats No. 12 - Sea Turtles.* St. Petersburg, Fl. For more information contact the Florida Department of Natural Resources, 3900 Commonwealth Blvd., Tallahassee, FL 32399.

Hammocks Beach State Park Files. For more information contact Hammocks Beach State Park, 1572 Hammocks Beach Road, Swansboro, NC 28584.

Jacobs, Francine. 1981. *Sea Turtles - Las Tortugas Marinas.* For more information contact the Center for Marine Conservation, 1725 DeSales St. NW, Washington, DC 20036.

Keinath, John A., Richard A. Byles, Jack A. Musick. 1989. "Satellite Telemetry of Loggerhead Turtles in the Western North Atlantic," *Proceedings of the Ninth Annual Workshop of Sea Turtle Conservation and Biology.* For more information contact the National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Dr., Miami, FL 33149.

Nelson, D.A. 1988. "Life History and Environmental Requirements of Loggerhead Turtles. *U.S. Fish and Wildlife Service Biological Report* 88(23), U.S. Army Corps of Engineers TREL-86-2 (Rev).

Ogren, Larry (ed). 1989. *Proceedings of the Second Western Atlantic Turtle Symposium.* For more information contact the National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, 3500 Delwood Beach Road, Panama City, FL 32408.

Pritchard, P., P. Bacon, F. Berry, A. Carr, J. Fletemeyer, R. Gallagher, S. Hopkins, R. Lankford, R. Marquez M., L. Ogren, W. Pringle, Jr., H. Reichart and R. Witham. 1983. *Manual of Sea Turtle Research and Conservation Techniques,* 2nd ed. K. A. Bjorndal and G. H. Balazs, editors. For more information, contact the Center for Marine conservation, 1725 DeSales St. NW, Washington, DC 20036.

Rohling, Jane. August, 1988. "Home is Where the Shell Is." *Wildlife in North Carolina.* For more information, contact the Wildlife Resources Commission, 512 North Salisbury Street, Raleigh, NC. 27604-1148.

Rudloe, Jack. 1980. *Time of the Turtle.* New York, NY: Penguin Books.

United States Congress. Endangered Species Act of 1973. For information, contact U.S. Fish and Wildlife Service, Office of Endangered Species, Washington, DC 20240.

Van Meter, Victoria Brook. *Florida's Sea Turtles.* May 1986. For more information contact Florida Power and Light Co., Corporate Communications, PO Box 029100, Miami, FL 33102.

Western Regional Environmental Education Council. 1987. *Aquatic Project Wild.* For information contact the Wildlife Resources Commission, 512 North Salisbury St., Raleigh, NC 27604-1188.

Woody, Jack B. 1988. "International Sea Turtle Program of the U.S. Fish & Wildlife Service." *Proceedings of the Eighth Annual Workshop of Sea Turtle Conservation and Biology.* For more information contact the National Marine Fisheries Service, Southeast Fisheries Center, 75 Virginia Beach Dr., Miami, FL 33149.

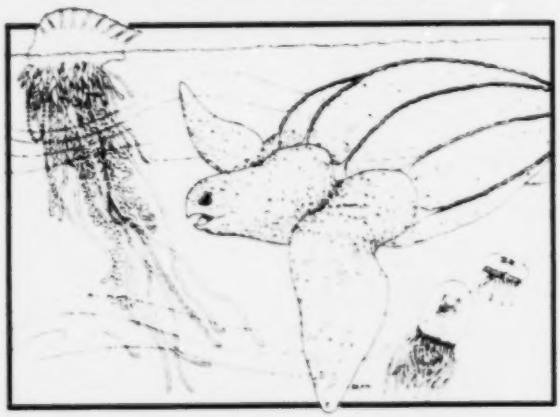
Appendix 1 Sea Turtle Fact Sheet

Sea turtles inhabited the earth over 150 million years ago and today only eight species of these ocean dwelling **reptiles** remain. Some scientists believe there are only seven. Once marsh dwelling animals, they evolved and adapted for life in the sea, the female returning to shore only to lay her eggs. Sea turtles are found throughout the world in tropic to **temperate** oceans. On occasions they might travel into cooler regions. Most species, migrate through international and territorial waters, going from feeding to **nesting** grounds.

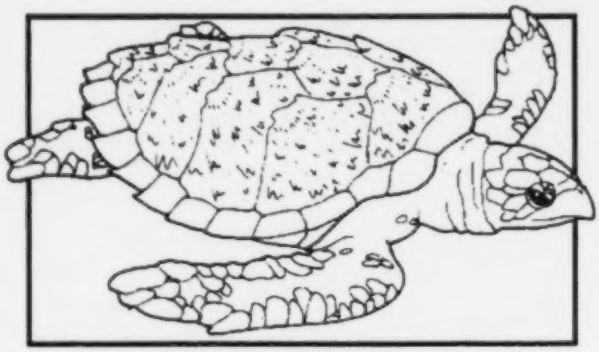
Generally, the only time sea turtles leave the protective **habitat** of the ocean is when the female lumbers ashore to nest. Under the cover of darkness, the female drags her large body toward an area usually above the high tide line. She digs a hole with her rear flippers and deposits more than 100 eggs. While laying, she sheds tears which wash the sand from her eyes. She covers the eggs and returns to the ocean leaving the future **hatchlings** to fend for themselves. After an incubation period of 50-80 days, the young turtles break out of their shells and rest until a time, several nights later, when they scramble out of the sand. Guided by the reflective light of the horizon, they race to the ocean they have never seen. Once reaching the sea, little is known about their movement and fate until, when mature, the females come ashore to nest. It is estimated that only 1 in 10,000 survives to adulthood.

By 1990 all species of sea turtles were severely depleted. Three of these species, leatherback, Kemp's Ridley (or Atlantic Ridley) and hawksbill, appear on the U. S. **Endangered Species** List. The loggerhead and green are classified as **threatened**. Loggerhead, leatherback, hawksbill, Kemp's Ridley and green sea turtles are found within the Atlantic Ocean off the coast of North Carolina. The olive Ridley is generally found in the Pacific, Indian Oceans and in the southern and eastern regions of the Atlantic. The black turtle is thought to be either a separate species or a variety of the green turtle, and the flatback is found off the coast of Australia.

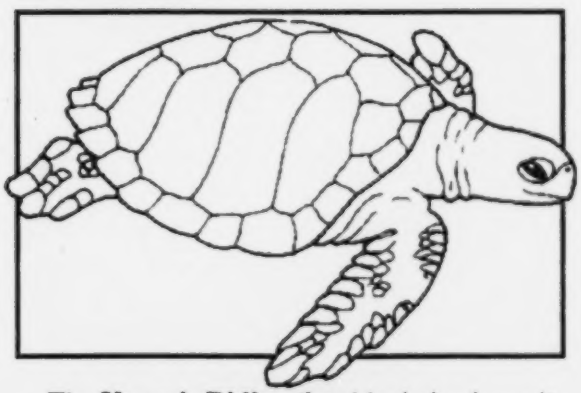
The **leatherback** (Dermochelys coriacea) is the largest of all turtles, weighing 1,300 pounds or more, while reaching lengths of six feet. Major taxonomic differences place the



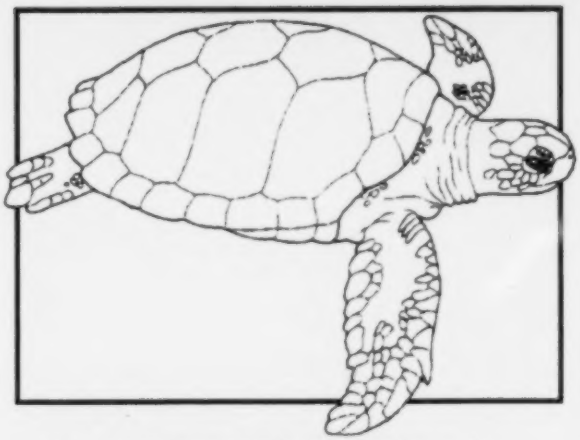
leatherback in a separate family from all other marine turtles. Unlike other species, the leatherback lacks an outer shell or scutes; their soft shell is characterized by seven long ridges. Their flippers are clawless. They inhabit both the tropic waters of South America and cooler **latitudes** of Nova Scotia. The leatherback's diet consists entirely of **jellyfish**.



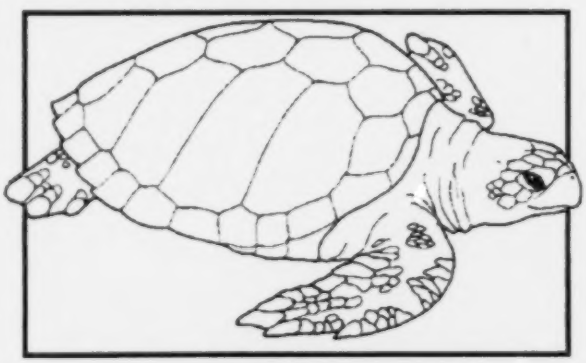
The **hawksbill** (Eretmochelys imbricata), is a small sea turtle, commonly 110 lbs., with a narrow birdlike **beak** for which it is named. Inhabiting coastal waters around coral reefs, the hawksbill is **omnivorous,** consuming jellyfish, sponges, **crustaceans** and sea grasses. Their colored shell, highly valued for jewelry, is the most serious threat to this species' continued survival.



The **Kemp's Ridley** (Lepidochelys kempi), also called the Atlantic Ridley, is the most severely depleted of the sea turtles. A small sea turtle weighing up to 100 lbs., the Kemp's has a gray circular shell. Although only one nesting site remains, Kemp's are found throughout the Gulf of Mexico and along some Atlantic coasts. The females of this species arrive at their nesting beach together *en masse* in what are called "arribidas," (Spanish for 'arrivals'). Although their nesting beach in Mexico is now fully protected, past "arribidas" provided an easy opportunity for large commercial slaughters which have resulted in their present low numbers.



The **green sea turtle** (Chelonia mydas), is so named for the color of its fat and may weigh over 300 lbs. It has an oval olive-brown **carapace** with darker streaks. Greens have been found as far north as New England and south to Argentina. Nesting occur along the Western Caribbean coast and in Surinam. Green turtles are predominantly **herbivorous**, feeding on seaweed and sea grasses.



The **loggerhead** (Caretta caretta), has a heart shaped brown carapace, a large head (10 - 12" long) and a hard horny beak. The loggerhead can grow to three feet and weigh more than 300 pounds. Although a highly migratory animal, Florida continues to be one of their more important nesting grounds. Primarily **carnivorous**, loggerheads feed on mollusks, crabs, fish and jellyfish. More than 99 percent of the nesting sea turtles in North Carolina are loggerheads.

Appendix 2 Loggerhead Sea Turtle Fact Sheet

Common Name	Loggerhead, Lanternback
Scientific Name	Caretta caretta
Status	Designated as threatened on both the Federal Fish & Wildlife and North Carolina Endangered Species lists.
Distribution	Loggerhead sea turtles are found world-wide in temperate to sub-tropical waters.
Description	Loggerhead sea turtles are named for their large head. They are brown to reddish brown in color. Adults generally weigh 200-300 pounds and have carapaces (shells) 36 to 42 inches long. Newly hatched sea turtles have carapace about 2 inches long. It is unknown how long sea turtles live, although it is believed they typically live 80-100 years.
Behavior/Adaptations	Loggerhead sea turtles are well adapted to life at sea, with long flippers and special glands so they can drink salt water. They are relatively slow swimmers but will put on a burst of speed when threatened. The largest natural threats to them are sharks and killer whales. Sea turtles nest on the beach. Generally they return to that same beach to nest when they reach sexual maturity (4 to 40 years).
Life History	Loggerhead sea turtles are omnivorous, eating mollusks, crabs, jelly-fish, seaweed, shrimp and algae. They spend most of their time in coastal waters, however they have been seen as far as 500 miles out at sea. Prior to the nesting season of May-June in North Carolina, the males and females gather offshore for their mating rituals. After mating, the female is able to store the viable sperm for the rest of the mating season, allowing her to nest 1-6 times and still have fertile eggs. When she is ready to nest, she crawls up the beach at night past the high tide line, digs a nest and deposits an average of 120 ping pong ball sized eggs before covering the nest over and returning to the sea. The baby sea turtles hatch about 55-80 days later, and at dusk they leave the nest, crawl rapidly to the surf and swim to get caught in currents which will carry them away from shore.

THREATS TO SURVIVAL

Adult loggerhead sea turtles have few natural predators except for sharks and killer whales. On land, hatchlings are eaten by raccoons, ghost crabs, sea gulls, fox and other animals. Although these animals will sometimes wipe out a nest, the largest threat to all sea turtles is that from humans. Throughout much of the world sea turtles are not protected. From egg to adulthood, the turtles are collected for food, aphrodisiacs and trinkets (tortoise shell jewelry, stuffed turtles, knick-knacks, etc.). All along the coast sea turtles are caught in commercial fishing nets (some 11-12,000 turtles die this way each year), discarded plastics, discarded fishing nets and lines, and other forms of pollution. Each year more and more beach fronts are developed, destroying the sea turtles' nesting beaches. All of this is causing the loggerhead sea turtle population to remain in jeopardy.

Conservation work is presently being done to promote public education and research which will hopefully help us better protect this important animal.

FUN FACTS

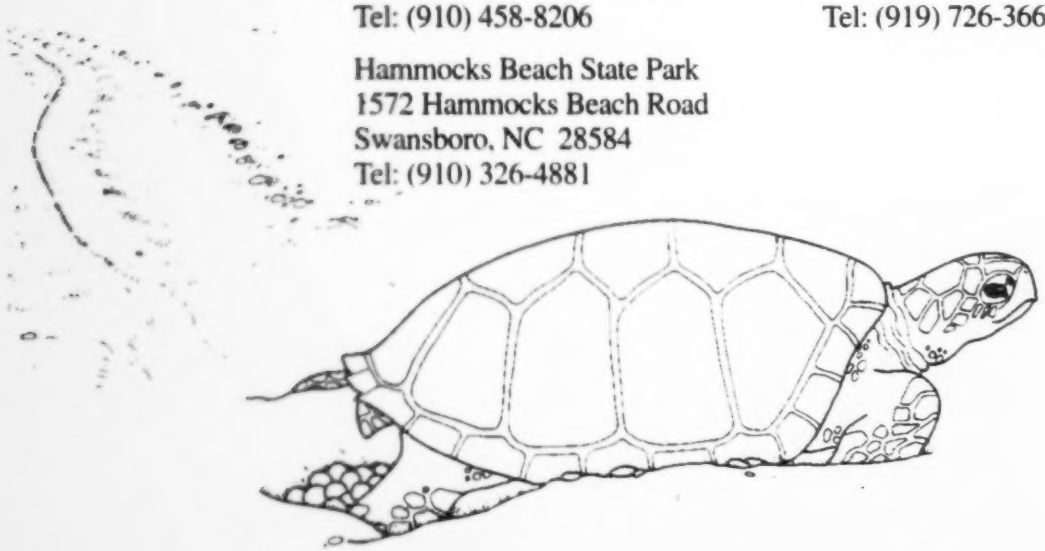
Loggerhead sea turtles are non-vocal. They have excellent eyesight under water, although they are near-sighted on land. They have an excellent sense of smell. Sea turtles have evolved over a very long period of time, at least 150 million years (humans have been around less than 1 million years)! It is estimated that 1 in 10,000 sea turtles survives from hatching to sexual maturity. A sea turtle's sex is determined by the incubation temperature of the sand around the clutch (cooler temperatures make more males, warmer temperatures make more females).

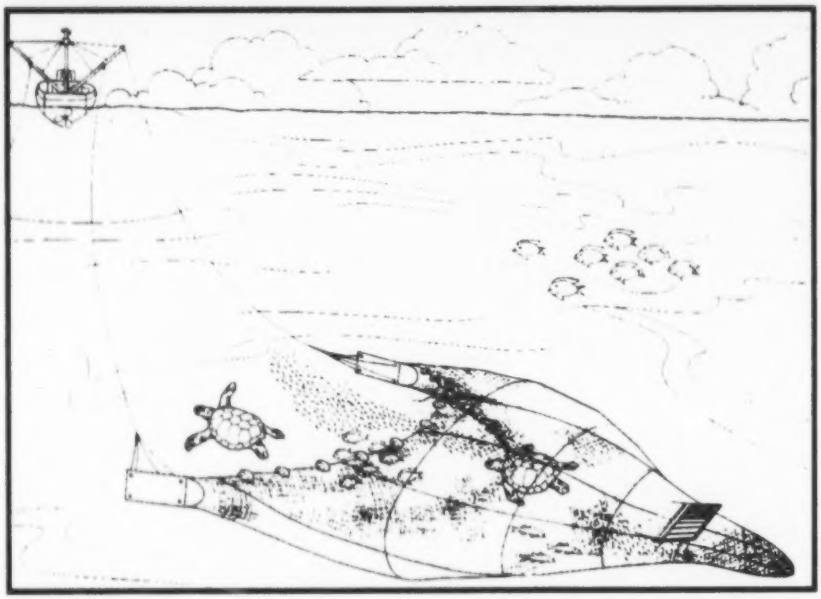
For more information about loggerhead sea turtles and what is being done in North Carolina State Parks contact:

Fort Fisher State Recreation Area
Post Office Box 475
Carolina Beach, NC 28428
Tel: (910) 458-8206

Fort Macon State Park
P. O. Box 127
Atlantic Beach, NC 28512
Tel: (919) 726-3665

Hammocks Beach State Park
1572 Hammocks Beach Road
Swansboro, NC 28584
Tel: (910) 326-4881





Since Kemp's Ridleys nest in large groups on a beach in Mexico, their numbers are easier to estimate than other sea turtle species. In 1947, biologists estimated that 100,000 Ridleys used the nesting beach. This number dropped to 2,000 to 3,000 nesting turtles by the early 1970s. In 1986, biologists counted only 572 Ridleys on the nesting beach. All other species have shown similar rapid population declines. While fully protected in the U.S. under the Endangered Species Act (which fines offenders), sea turtles are not afforded this protective status throughout their range. We protect nest sites from poachers in the United States, only to have these same turtles legally slaughtered in another country. Despite U.S. protection, regulations and efforts, no population of sea turtle has shown a significant increase in numbers. Commercial exploitation, accidental (incidental) drowning in shrimp nets, and habitat destruction of nesting sites pose continued threats to the sea turtle's survival.

Commercial Exploitation

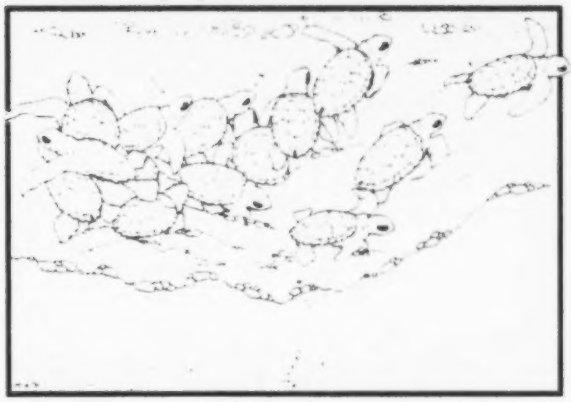
Throughout their range, sea turtles suffer exploitation at the hands of people during their entire life cycle. Adults are harpooned or speared from the water, or flipped over on their backs while attempting to nest. The meat (especially from the green sea turtle) is a prized delicacy; flippers are used for leather products; cartilage is used in turtle soup; and the shell, predominantly from the hawksbill, is used for tortoise shell jewelry. Nests are plundered for eggs and eaten locally or exported to other markets. Even hatchlings, while struggling to reach the ocean, are caught and molded in plastic for paper weights and other "curio" items. International trade in such turtle products,whether legal or illegal, continues to be a money-making venture, thus the slaughter continues.

Incidental

In 1981, it was estimated that over 12,600 turtles died in the U.S. alone as a result of shrimping operations. The turtles caught during trawling operations are unable to surface for air, and drown.

The National Marine Fisheries Service (NMFS) has developed a device 97% effective in releasing sea turtles caught during shrimping operations. The Turtle Excluder Device (TED) is installed inside, and just forward of, the end of the net. Turtles swimming through the net strike a deflector panel which forces them up and out a trap door. Furthermore, tests performed by NMFS have shown that the use of the TED increases shrimp take by 7%,discards unwanted fish, jellyfish and seaweed, and improves fuel efficiency.

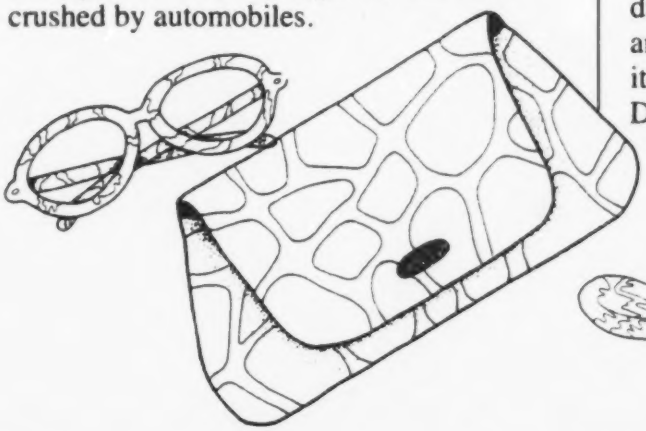
Another problem for turtles is the ingestion of plastic that has been discarded by people. The plastic bags (sandwich, potato chip and garbage bags), which look like jellyfish to sea turtles, are eaten by the turtles and clog their intestines. It is estimated that almost half of the oceanic turtles are affected by the plastic. Most dead turtles have consumed enough plastic to have contributed to



their death. One turtle had ingested enough plastic to cover an a 9 x 12 foot area.

Habitat Destruction/Alteration

Commercial and private development of shorelines has greatly reduced suitable nesting areas that are safe from salt water intrusion. Nests may also be subjected to foot traffic, automobile traffic and poachers. If the eggs survive, the street and building lights may confuse the hatchlings, attracting them to a brighter light source and away from the surf. An estimated 6,000 hatchlings died in 1992 in Melbourne, Florida, as they attempted to cross the highway and were crushed by automobiles.



What Conservation Agencies Are Doing

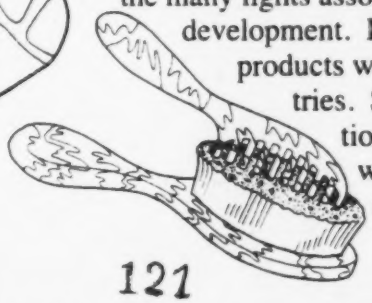
Greenpeace has worked closely with the wider Caribbean Sea Turtle Conservation Network (WIDECAST). Consisting of a team of scientists and conservationists, WIDECAST is producing a recovery plan for each of 38 nations throughout the sea turtle range. Together, they are working toward creating national and international laws for conservation, eliminating trade in sea turtle products, implementing nesting beach management and curbing petroleum impacts.

Working in cooperation with the National Marine Fisheries Service, conservationists are traveling to shrimping ports to encourage voluntary use of the TED. Greenpeace is acting as a mediator between government agencies and shrimpers to expand the use of this device on a global scale. Volunteers have formulated beach patrols to monitor and diminish threats posed by salt water intrusion and human related activity.

Conservationists discourage private and commercial shoreline development that damages nesting areas. They encourage the use of light diffusion devices on nesting beaches, so as not to distract females from nesting or disorient hatchlings upon emergence.

What You Can Do

Educate your friends and relatives about these unique reptiles. Report all nesting attempts and nests for protection. Do not disturb nesting females. Never discard anything, especially plastic, in the water as it may be mistaken for food or jellyfish. Discourage building on the coastline and the many lights associated with beach development. Do not buy turtle products while in other countries. Support organizations that are actively working to protect sea turtles.



SCHEDULING WORKSHEET

For office use only:
Date request received_____ Request received by_____

1) Name of group (school) _____

2) Contact person _____ _____
name phone (work) (home)

_____
address

3) Day/date/time of requested program _____

4) Program desired and program length _____

5) Meeting place _____

6) Time of arrival at park _____ Time of departure from park _____

7) Number of students _____ Age range (grade) _____
(Note: A maximum of 30 participants is recommended.)

8) Number of chaperones _____
(Note: One adult for every 10 students is recommended.)

9) Areas of special emphasis _____

10) Special considerations of group (e.g. allergies, health concerns, physical limitations)_____
_____

11) Have you or your group participated in park programs before? If yes, please indicate previous programs attended: _____
_____

12) Are parental permission forms required? _____ If yes, please use the Parental Permission form on page 9.2.

I, _____, have read the entire Environmental Education Learning Experience and understand and agree to all the conditions within it.

Return to: Hammocks Beach State Park
1572 Hammocks Beach Road
Swansboro, NC 28584

Fax #: (910) 326-2060

PARENTAL PERMISSION FORM

Dear Parent:

Your child will soon be involved in an exciting learning adventure - an environmental education experience at **Hammocks Beach State Park**. Studies have shown that such "hands-on" learning programs improve children's attitudes and performance in a broad range of school subjects.

In order to make your child's visit to "nature's classroom" as safe as possible we ask that you provide the following information and sign at the bottom. Please note that insects, poison ivy and other potential risks are a natural part of any outdoor setting. We advise that children bring appropriate clothing (long pants, rain gear, sturdy shoes) for their planned activities.

Child's name _____

Does your child:

- Have an allergy to bee stings or insect bites?_____
  If so, please have them bring their medication and stress that they, or the group leader, be able to administer it.

- Have other allergies? _____

- Have any other health problems we should be aware of?_____
  _____

- In case of an emergency, I give permission for my child to be treated by the attending physician. I understand that I would be notified as soon as possible.

_____ _____
Parent's signature date

Parent's name _____ Home phone _____
(please print) Work phone _____

Family Physician's name _____ phone _____

Alternate Emergency Contact

Name_____ phone _____

NORTH CAROLINA PARKS & RECREATION
PROGRAM EVALUATION

Please take a few moments to evaluate the program(s) you received. This will help us improve our service to you in the future.

1. Program title(s) _____ Date _____
   Program leader(s) _____

2. What part of the program(s) did you find the most interesting and useful? _____
   _____

3. What part(s) did you find the least interesting and useful? _____
   _____

4. What can we do to improve the program(s)? _____
   _____
   _____

5. General comments _____
   _____
   _____
   _____

LEADERS OF SCHOOL GROUPS AND OTHER ORGANIZED YOUTH GROUPS
PLEASE ANSWER THESE ADDITIONAL QUESTIONS:

6. Group (school) name _____

7. Did the program(s) meet the stated objectives or curriculum needs? _____
   If not, why? _____
   _____

Please return the completed form to park staff. Thank you.

Hammocks Beach State Park
1572 Hammocks Beach Road
Swansboro, NC 28584
Fax # (910) 326-2060